

*A webcomic of romance, sarcasm,  
math, and language*

**xkcd**

**RANDALL MUNROE**

**2011**

**xkcd**

**2011**

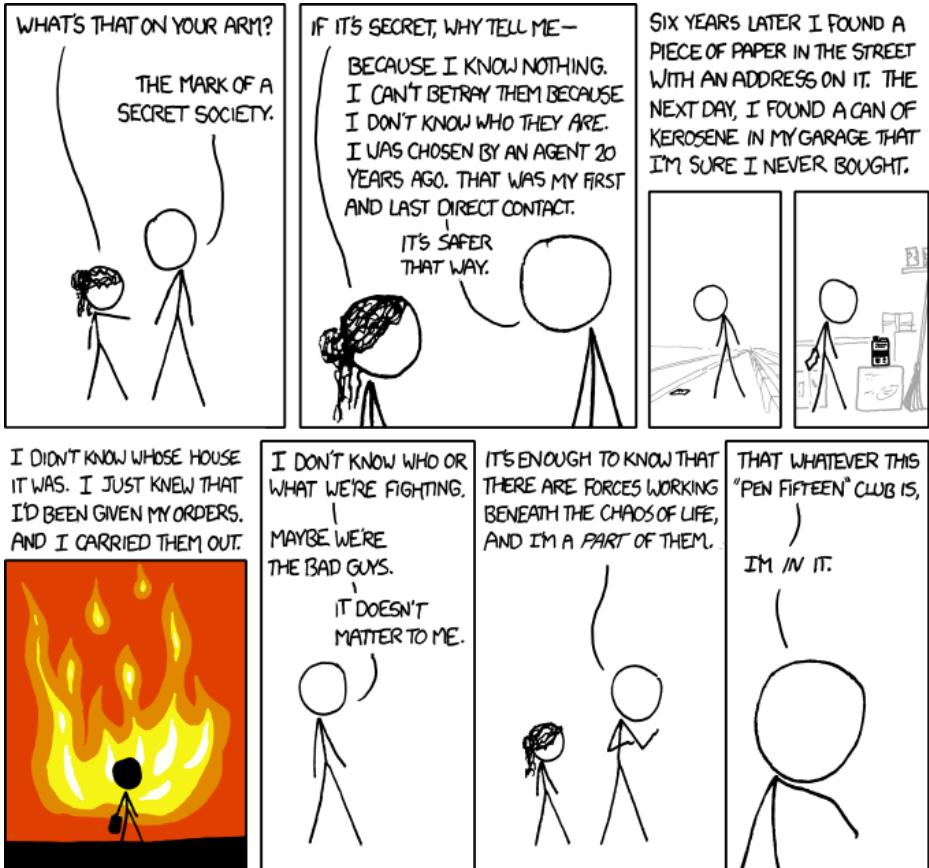
a collection of 156 webcomics

from #842 to #997

*by Randall Munroe*

## #842: Mark

January 03, 2011



I'm a solipsistic conspiracy theorist. I'm sure I must be up to something, and I will not stop until I find out what.

## Explanation

In this comic, Jill asks Cueball about a mark on his arm. He apparently believes he is part of a secret society, so secret that he doesn't know anything about the society. His belief in the existence of the society, and that he is a part of it, stem from one contact with an 'agent'. Most people would immediately dismiss the idea of such a secret society, especially with no evidence of its existence, and no knowledge of the goals or even whether it is inherently good or evil.

Six years after being 'chosen', Cueball finds a scrap of paper with an address on it, and a can of kerosene. Both of these events are not unlikely, and easily explained as simple coincidences, but Cueball somehow sees this as a command that he must burn down the house (maybe an example of ideas and delusions of reference). Cueball shows that he is willing to put other people's lives at risk, destroy property and possessions, and face the possibility of prison, all because of one event six years prior.

Cueball's belief in the society, his delusional linking of the address and kerosene, and his actions in burning down the house, show how badly he wants to be part of something bigger, and to find meaning in the "Chaos of Life".

The punchline refers to an old grade school/middle school prank (Urban Dictionary: pen 15 club, Pen 15.) You'd typically walk up to an unsuspecting schoolmate



and ask them if he wants to join the Pen Fifteen Club. You'd tell them that to join, you merely have to write the club name on them. You'd then write "PEN15" on their hand or arm, and everyone would laugh at them because it looks like "PENIS". (In a common variant, it is simply called the Pen Club, 15 is the victim's "member number", and the pranksters write "PEN13" and "PEN14" on themselves.) In this case, Cueball fell victim to this prank as a child without ever figuring out the joke, and the ink somehow never got washed off by showers or baths or removed by shedding skin. In reality, it would be unlikely for such a mark to last for so long. While methods of marking someone's skin more permanently do exist, it is hard to imagine someone tattooing or branding "PEN15" on their friend's arm as a prank.

It is also possible, considering the recurrence of absurd and surrealist humor on xkcd, that this comic's PEN15 club is indeed a dark secret society working to further mysterious goals. The punchline only makes sense to the viewer, who lives in a reality where "the pen fifteen club" is a middle school prank and not an Illuminati-esque shadow organization.[citation needed] Humor of this type is an example of dramatic irony.

The comic's title may refer to the mark on Cueball's arm, or to the fact that he is the 'mark' (i.e. victim) of the prank, or to the owner of the house he burnt down as the 'mark' of his imagined secret society. As for the title text, solipsism is the philosophical idea that only your own mind is sure to exist while other minds can't be really known and so those other minds are not proved to be

real. In this context it might mean that the only one who can conspire would be you, hiding the truth from yourself.

## #843: Misconceptions

January 05, 2011



I WISH I LIVED IN THIS UNIVERSE.

'Grandpa, what was it like in the Before time?' 'It was hell. People went around saying glass was a slow-flowing liquid. You folks these days don't know how good you have it.'

## Explanation

The Wikipedia article List of common misconceptions gives a list of commonly-repeated claims that are widely believed to be true, but actually are not.

The teacher, Miss Lenhart, is announcing that since it is the first Tuesday in February, by law and custom the reading of this article is requirement to stem the repetition of these incorrect anecdotes. (Funnily enough the comic was released the first Wednesday in January, which could just as well have been written in the comic).

This seems to be presented as something Randall would like to actually see: one day out of each school year spent to make the population aware of things that they're likely to hear at some point, but which have been proven to be false. The stated purpose is to make people "a little less wrong." Most of the misconceptions upon that page are trivial, and unlikely to be of real importance, but it's implied to be worth it for the sake of guests at future parties, implying that these bits of inaccurate trivia are often repeated in that environment (to subsequently annoy, confuse or misinform those listening, depending upon their own initial state of comprehension). There are however, some misconceptions that could have serious, real-world consequences, such as how long people have to wait before filing missing persons reports.

Logically, given all the facts/debunking laid out on that page being officially legislated as the final word, it would

remove much of the desire or ability to raise and discuss any such issues in smalltalk at all, which might be considered a mixed blessing. But it would inevitably give rise to other facts, or 'facts', being raised that are not (yet) known to correctly debunk, or be subject to debunking. Perhaps that single wikipedia page will (eventually) become the sole repository of all human knowledge which can be both misunderstood and corrected... a sizable corpus! This leaves room only for fervent agreement, plus divergent opinions about the unknown and unknowable.

In the caption below the comic Randall expresses his wishes that he lived in a parallel universe where this rule had been used for many years. So he would not have to listen to all these stories at every party he goes to. Since Randall likes to correct people if they are wrong (see 386: Duty Calls), not having to discuss with those that believe these misconceptions would make his parties much better. It may also improve the experience of all those who currently find themselves unwillingly on the receiving end of his corrections.

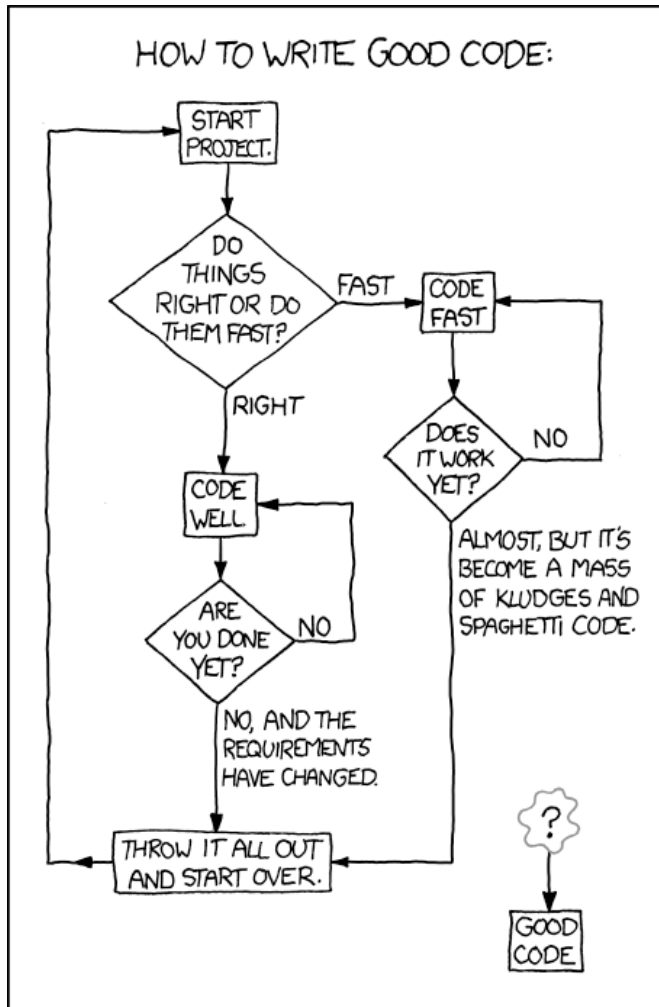
The title text refers to a specific one of these false stories about glass:

This myth likely arises from the fact that glass is an amorphous solid without a well-defined freezing point. In fact, glass becomes effectively solid once it cools down to around 1400 degrees centigrade. At room temperature, it cannot flow at perceptible rates over human timescales. Old window panes had variable

thickness due to the manufacturing process, and the thick end was generally (though not always) placed at the bottom for stability.

## #844: Good Code

January 07, 2011



You can either hang out in the Android Loop or the HURD loop.

## Explanation

The comic references the common meme of programmers that one can't actually write good code. Either the code is done quickly with shoddy "code style", weak logical structure, or any number of other kludges and hacks which turn maintenance of the code into a nightmare; or else it is written well and beautifully structured, but can never be completed before changes in the situation cause the original code design to be insufficient for one or multiple reasons.

Either situation eventually leads to the need to completely start from scratch, designing and writing the program's code all over again. Of course, the writing of this new program is also locked in the perpetual cycle of choosing between ugly/bad code that works marginally well, or good/pretty code that never gets completed before being obsolete.

Additionally, the humorous point is being further emphasized for the primary target audience, programmers, by using an infinite loop - or more precisely, 2 possible loops and 1 forced loop in the flowchart itself.

Also, of particular note, is the fact that Randall (the author) drives home the point of the inescapability of the infinite loop(s) by the use of the additional, disconnected, and logically unreachable portion of the flowchart. This disconnect points out that the only way



to actually get to "Good Code" using the flow chart would be to follow a path of actions — which does not start at the prescribed place — for which there is only an unknown and possibly unknowable starting action which no one has ever discovered previously. Other flowchart comics, several of which are also infinite loops, can be found here.

The title text, "You can either hang out in the Android Loop or the HURD loop," makes a dig at both communities: claiming that Android developers always opt for fast, ugly code, necessitating frequent fixes and updates, while Hurd developers perennially choose to "do the job right" but can therefore never seem to finish their project.

The GNU Hurd Project aims to create the kernel for the GNU Operating System (the kernel being the central and most indispensable component). The GNU Project is most famous these days as a result of GNU/Linux (commonly called just "Linux"), which is an operating system that uses the Linux kernel with the GNU system environment. From the beginning the GNU Project has planned to design their own kernel, the Hurd, virtually from scratch, and given a relatively clean slate with which to work, elected to employ a number of promising and theoretically elegant design concepts. Despite or, as Randall suggests, because of this, the Hurd has been mired in development hell for many years (for decades, in fact) with little progress towards actual usability outside of a small community of kernel hackers. While runnable GNU/Hurd operating systems do exist, they're still

basically experimental, and the Hurd remains a collection of research software the design goalposts for which keep receding as other, more pragmatically-engineered technologies continue to be developed (the Linux kernel itself being the canonical first instance of this).

Finally, the official transcript of this comic is itself somewhat humorous (an additional inside joke, if you will) in that it converts the flowchart into a simple list of instructions (aka pseudo-code) using numbered lines as reference points for identifying which instruction to read and follow next. This process is basically identical to the oft-maligned programming technique of using so-called "goto loops." — Furthermore, there is also a slight cross-reference between infinite loops and goto loops which is probably being referenced, in that goto loops are often criticized (whether accurately or not) as being more likely to create unintended infinite loops in code... primarily because of the difficulty inherent in keeping track of possible entry and exit paths, especially when making edits to the code at a later time.

## #845: Modern History

January 10, 2011



MY HOBBY: REAL-TIME  
WAR REENACTMENT

During the week, I research my character by living in his house and raising his children.

## Explanation

War reenactment is a hobby in which people act out a battle from some previous time period. Most reenactments are of famous battles in the area, such as the Battle of Gettysburg, or the The Battle of Hastings. The reenactors usually set up camps, and sometimes talk to spectators before the battle and teach them about the time period. Some reenactments can last several days with the reenactors setting up camps and sleeping several nights there.

Theoretical "real-time" war reenactment takes this one step further by having someone act out a war that is actually happening at the time. This would be annoying for the actual soldiers, as it would be hard to do your job if someone was right behind you imitating (and distracting) you. It would also be hard for the reenactor to get to the war zone without getting killed or detained, especially if the person the reenactor was imitating gets killed.

The title text refers to how someone would research the character that someone would play in a normal war reenactment for a more enjoyable and accurate reenactment. Once again, the title text makes a real-time version of this, having someone actually live the life of the real-time fighter. This is not a good idea for several reasons.[citation needed]

## #846: Dental Nerve

January 12, 2011



WAKE up in the MORNING and my BREATH ain't PRETTY / and noBODY'S gonna KISS me if my MOUTH smells SHitty / so I ALWAYS brush my TEETH before I START on the JACK / sure, my DRINKING's out of HAND, but I'm CONTROLLING my PLAQUE.

## Explanation

Ke\$ha is a pop/rap singer, and this strip refers to her 2009-10 hit single "Tik Tok." The song begins with the following lyrics, of which the title text is a parody:

A "bottle of Jack" refers to the Jack Daniel's brand of whiskey.

The strip depicts Megan warning Ke\$ha not to neglect dental hygiene by using whiskey instead of toothpaste to freshen her breath, due to the severe pain that could result if she let the nerves in her teeth become infected. The title text displays dental-hygiene-friendly lyrics, with emphasis on certain syllables (as all-caps) to imitate the rhythm of the original song.

## #847: Stingray Nebula

January 14, 2011



Erendil will patrol the walls of night only until the sun reaches red giant stage, engulfing the Morning Star on his brow. Light and high beauty are passing things as well.

## Explanation

The Stingray Nebula, in the constellation Ara, is the youngest known planetary nebula in the Milky Way galaxy. It was formed by an asymptotic giant branch (AGB) B1 supergiant, which ejected its outer layers during the 1980s. It now appears as a white dwarf star in the center of an expanding gaseous nebula.

This comic went from a reassuring comic about stars at night giving hope in the darkness, but then as with most xkcd's, it took a turn. In this case, the twist is that because Cueball's star he got attached to exploded into a nebula, we should only become attached to stars that aren't quite as volatile as the one that formed the Stingray Nebula.

The formation of a planetary nebula is not usually referred to as an explosion, since it is a quite slow process, which, in the case of the stingray nebula, took about 20 years (1970-1990). When Randal describes it as an explosion happening exactly in 1987, it is possible that he is confusing it with the famous supernova SN 1987A, the closest and brightest observed supernova since Kepler's supernova of 1604.

While talking about his star, Cueball shares with his friend a quote from the Lord of the Rings: The Return of the King, the third installment in J.R.R. Tolkien's epic fantasy series. Sam and his friend Frodo were forced to travel through Mordor, a land of fire and death, to



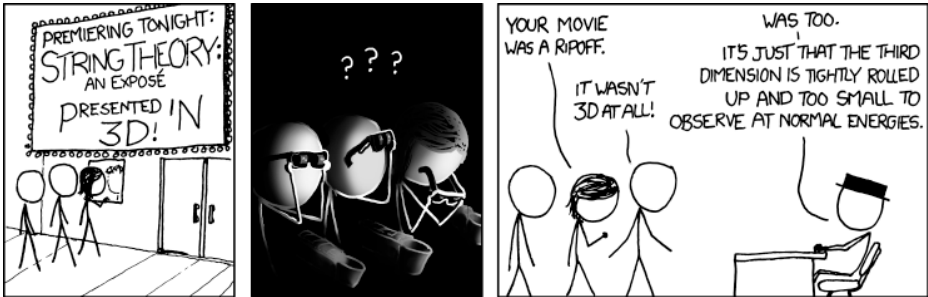
destroy the malevolent One Ring. The journey's hardship took a psychological toll on each of them.

Cueball compares his struggles as a kid, and his friend's struggles in the present, to Sam and Frodo's arduous journey through Mordor. Both he and Sam were able to find beauty and solace in the glimmering of some distant light. By attaching their hopes, woes and feelings to this small point of hope, they both get a sense of perspective and comfort in the fact that there is beauty in a greater sense before them.

The title text ties into the Tolkien quote. Eärendil, with a Silmaril strapped to his ship, Vingilot, is the Tolkienian myth explanation for the planet Venus, which has historically been mistaken for a star due to its brightness, being known as the "morning star" or "evening star". Venus will eventually (in billions of years time) be engulfed by the sun's expansion into a red giant. The source of Sam's comfort is also temporary in the long term.

## #848: 3D

January 17, 2011



The **LINAC**s in the glasses frames can barely manage one MeV. You should've gone to the screening at **CERN**.

## Explanation

String theory hypothesizes that there are many more than 3 dimensions, it's just that we can't see the rest because they're "rolled up." A common metaphor is an ant on a tightrope — it has two degrees of freedom, one along the rope and one around it, but from far away we can only see one.

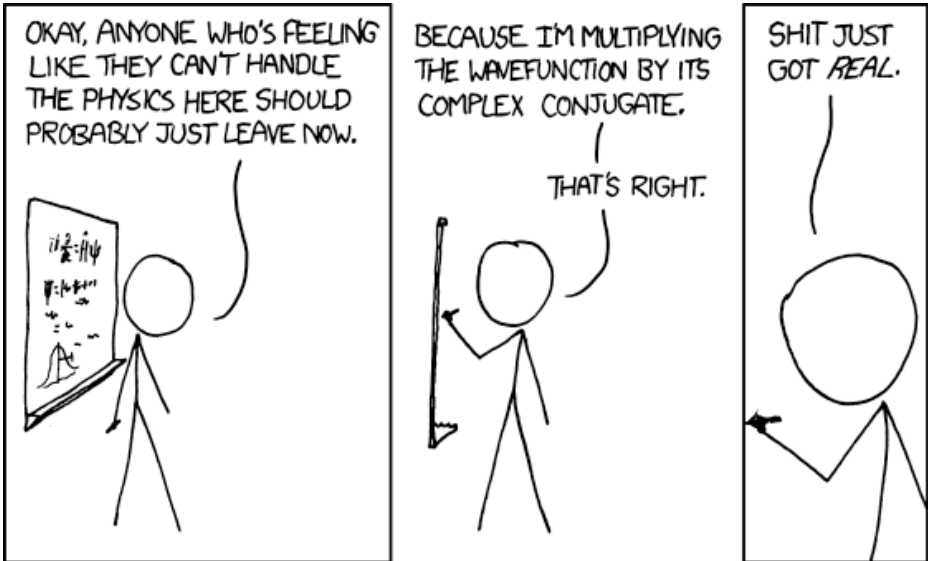
Knowing this, Black Hat, showing his typical behaviour, released his 2D movie about string theory in "3D", and claimed that the third dimension was there — just too small to see.

The title text refers to a linear particle accelerator, or "LINAC", which is used to create high-energy particles. Incidentally, the glasses give their particles one mega-electronvolt (symbol MeV) of energy, which is not particularly high for a particle accelerator. The title text suggests that such moviegoers should try the accelerators at the European Organization for Nuclear Research, CERN, since they are widely known for producing the highest energies in the TeV, and thus have the best chance of unraveling the small dimensions of string theory.

On the xk3d prank site created along with 880: Headache, the 3D on this comic is not visible.

## #849: Complex Conjugate

January 19, 2011



Fun fact: if you say this every time a professor does something to a complex-number equation that drops the imaginary part, they'll eventually move the class to another room and tell everyone else except you.

## Explanation

This was the second comic with one of Randall's fun facts.

This comic is a joke on the phrase "Shit just got real", which means "something has suddenly increased in difficulty and become genuinely challenging or dangerous".

Cueball is standing in front of a board delivering a lesson, and is about to multiply a wavefunction by its complex conjugate. A wave function is a mathematical description of a quantum system which uses complex values - numbers that have both a real part and an imaginary part. Multiplying a wavefunction by its complex conjugate is a common thing to do, as it yields the probability density of where a particle is likely to be found, which is a real-valued function.

Complex numbers can be written in the form  $a + bi$ , where  $a$  is the real part and  $bi$  is the imaginary part.  $i$  is the imaginary unit, defined so that  $i^2 = -1$ . The complex conjugate of a complex number simply reverses the sign on the imaginary part - so for the number above, the complex conjugate is  $a - bi$ .

Multiplying the complex number by its own complex conjugate therefore yields  $(a + bi)(a - bi)$ . If you multiply out the brackets, you get  $a^2 + abi - abi - b^2i^2$ . The  $abi$  cancel each other out, and  $i^2$  can be replaced by  $-1$ . Thus,

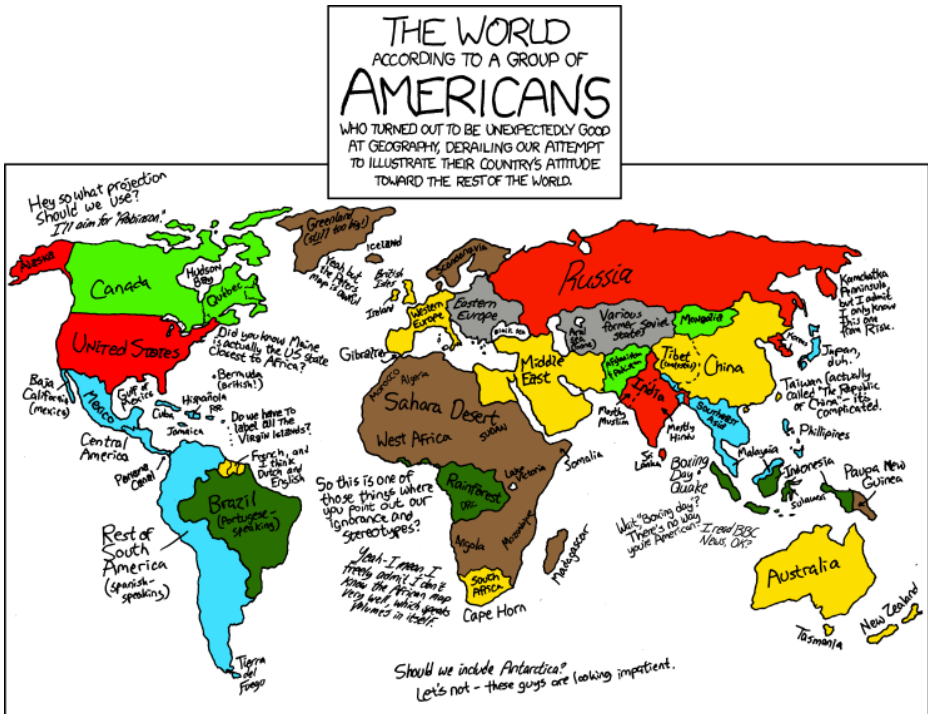
the result is  $a^2 + b^2$ , a real number, so "shit just got real" as Cueball promised.

The title text notes that you can make this joke in class every time a calculation is performed that drops the imaginary part from a complex number, but warns that it would be so annoying that the professor will eventually find a way to have the class without you in it. Because nonreal numbers are often considered to have no physical significance, turning them into real numbers to produce a final answer is so common that this joke would quickly become tedious.

The wave function shown on Cueball's board is the time-dependent Schrödinger equation, a differential equation that the wavefunction  $\Psi$ , which determines the possible positions of a quantum particle over time, always satisfies. The derivative should be written with  $\partial\Psi$  on the top; the omission of the  $\Psi$  may be a mistake.

## #850: World According to Americans

January 21, 2011



It's not our fault we caught a group on their way home from a geography bee. And they taught us that Uzbekistan is one of the world's two doubly-landlocked countries!

## Explanation

There's a somewhat well-circulated image on the internet entitled "The World According to Americans" which plays on the stereotype of the ignorant American. In it, the entirety of Eastern Europe and most of Asia are entitled "commies" and the Middle-East as "evil-doers," and so on. Later, other people created similar maps to re-do the concept. It later spread to other cultures.

This comic is an anti-joke playing on that idea. You expect to see something which plays on the stereotypes that exist in American culture of various parts of the world. However, instead, the map is remarkably well-informed, and shows how sampling bias can be used to conflate results. See below the table of items in the map.

The title text jokes that it was "not their fault" that the Americans involved were coming from a geography bee. On the other hand, if even apparent geography buffs use vague labels such as "rest of South America" and "various former Soviet states" instead of using more detailed labels, the average American are likely even less geographically knowledgeable. (Although, as the illustrators wrote below Cape Horn, the reason they did not draw Antarctica or many South American, Middle Eastern and British countries and the lack of detail may be because the people who asked them to draw this map were beginning to 'look impatient' since they did not get the expected ignorant result.)

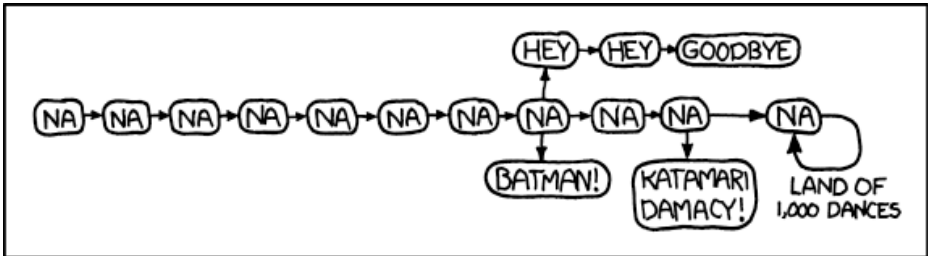


A landlocked country is a country that does not border any major bodies of water. Furthering the concept, a doubly-landlocked country is a country that not only has no connection to water, but is only bordered by other landlocked countries. As the title text states, there are only two such countries in the world as of the date of the comic: Uzbekistan and Liechtenstein. South Sudan became officially recognised as a new independant state not long after this comic's publication but, being only a singly-landlocked nation, did not alter this particular statistic. This is the type of fact that may be stereotypically expected to be known by a sufficiently well-prepared geography bee competitor.

**Table of items in the map[edit]**

## #851: Na

*January 24, 2011*



I hear that there are actual lyrics later on in Land of 1,000 Dances, but other than the occasional 'I said,' I've never listened long enough to hear any of them.

## Explanation

The repetition of the syllable "na" is often used to sing a tune without using any of the actual words. While this is normally done to practice or demonstrate a tune, repeated "na"s are also a part of some songs' lyrics, as shown in this comic. Following the various paths of the diagram forms the words of several well-known tunes, with each song branching off after the appropriate number of "na"s.

The top entry refers to the song "Na Na Hey Hey Kiss Him Goodbye," originally recorded by Steam. The tune is often sung by the home fans of American sporting events at the end of a victory as a means of taunting the away team. The left bottom entry refers to the theme song of the '60s TV show, written by Neil Hefti. Batman. The middle bottom entry refers to the theme song of the video game Katamari Damacy, which was also the cause of the accident in comic 161: Accident. The right bottom entry refers to the song "Land of a Thousand Dances," originally recorded by Chris Kenner. The title text jokes that the tune's incessant repetition of "na" has annoyed Randall to the point that he does not have the patience to listen to the whole song. This is one of many flowchart comics. A full list can be found [here](#).

There are likely countless other songs that uses "Na Na Na" as part of the lyrics. Some will be more popular than others. A very popular song that goes: Naaa Naaa Naaa Na Na Na Naaa, Na Na Na Naaaa, Hey Jude was left

out. Hey Jude must have been brought to Randall's attention after this comic was released, as he made a comment about it in the comic header the day after this comic was released, see Trivia below.

## #852: Local g

January 26, 2011



In Rio de Janeiro in 2016, the same jump will get an athlete 0.25% higher (>1cm) than in London four years prior.

## Explanation

Cueball explains in the first panel, that the centrifugal force (not be confused with the centripetal force, which is made clear in 123: Centrifugal Force, cited in the first frame of this comic) along with variations in the earth's shape causes the gravitational force to vary by half a percent between some cities. These variations could have a significant effect on certain sporting events; for example, Cueball explains that a pole vaulter might jump 2 cm higher in a city with a smaller gravitational force.

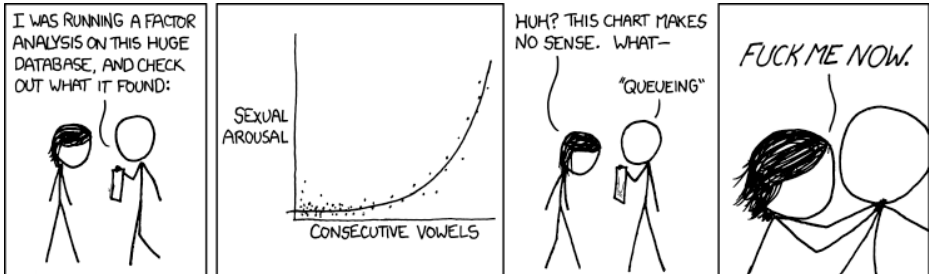
So Cueball writes an article reevaluating pole vaulting world records based on the city in which the record was accomplished. His article suggests that some athletes should not have received an award for breaking a record because they did so in a city with a below-average gravitational force. These pole vaulters whose records were questioned by Cueball's article angrily stage a protest outside of Cueball's apartment.

Then Cueball proceeds to taunt them reasoning that they can't harm him because his building is locked. Cueball and Megan then hear a crash indicating that the protesters have managed to reach the apartment's balcony. When Cueball asks out loud how the pole vaulters reached the balcony, Megan stares at him for a moment and then he realizes the stupidity of that question: the pole vaulters pole-vaulted onto the balcony.

In the title text Randall explains that in fact the gravity force at the Olympic Games at Rio de Janeiro in 2016 compared to London in 2012 will make a difference of more than one centimeter, mainly because Rio de Janeiro is much closer to the equator than London resulting in an increased centrifugal, or, perhaps centripetal if you prefer to be more contrasting, force.

## #853: Consecutive Vowels

January 28, 2011



But the windows! What if there's a voyeur watchi-- wait, now I'm turned on too.



## Explanation

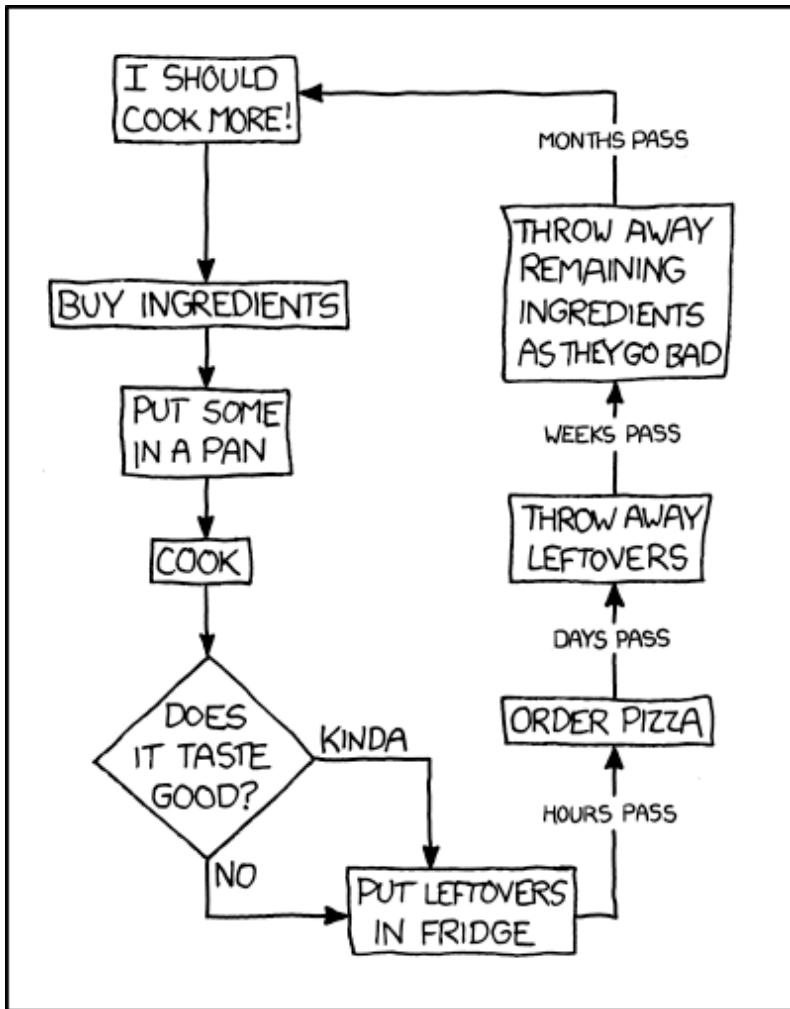
After running some analysis on a database, Cueball shows Megan a chart depicting the relationship between sexual arousal and consecutive vowels, showing that a high amount of consecutive vowels is linked to higher sexual arousal. At first, it could be theorised to be due to drawn out moans or screams during lovemaking and orgasm (Ooooh! Yeeeee!).

Megan says she doesn't get it, but Cueball interrupts her with "queueing", a word with 5 consecutive vowels. This immediately arouses Megan, who grabs Cueball and shouts "FUCK ME NOW." It turns out that the consecutive vowels themselves appear to cause arousal, rather than arousal causing the use of consecutive vowels.

The title text shows that Cueball is fearful that there may be a voyeur peeking at them, but as "voyeur" has 4 consecutive vowels because "y" is a vowel in this case, Cueball gets turned on as well.

## #854: Learning to Cook

January 31, 2011



And yet I never stop thinking, 'sure, these ingredients cost more than a restaurant meal, but think how many meals I'll get out of them! Especially since each one will have leftovers!'

## Explanation

This comic shows the plight of Randall who occasionally motivates himself to cook. After buying ingredients and cooking them, the food always ended up either tasted "kinda good" or not good, therefore - although he puts the leftovers in the fridge - hours later he orders pizza instead of eating the leftovers.

A few days later he first throws away the leftovers, and some weeks later also the unused ingredients. After some months he is motivated again to cook more and the loop repeats. This discontinued effort may be part of the reason his cooking does not improve much over time.

The title text describes that buying ingredients for a single meal might be more expensive than eating at a restaurant, but it would be compensated if there are enough leftovers to eat again from it or cook several meals. Of course, this idea is vitiated if he gives up cooking after a single try and throws away all remaining food.

#855: 1999

February 02, 2011



'Whoa, twenty-two in two hours!' 'Your site got twenty-two hundred hits in two hours?' 'No. Twenty-two. But still, that's like half the people on the internet!'

## Explanation

This comic is a parody of the movie *The Social Network*, a movie about the founding of the popular social network site Facebook. Here, scenes from the movie are reimagined to feature Zombo.com instead. Zombo.com, also known as Zombocom, is a website that was created in 1999 and using only Flash animations. The animation consists of a circle of quickly pulsating dots and a friendly deep male voice repeatedly welcoming the visitor to "Zombocom" and explaining that there was no limit to what could be done at the site, or rather, no limit except yourself. The message, a parody of how sites of the time used a flash introduction while the rest of the site loaded, repeats while, ironically, there is absolutely nothing that can be done at the site until the message completes, at which point a link saying "Sign up for our newZletter" appears, linking to a page saying that the selected option is not available yet. If the link is not clicked, the Flash player will reset. Thus, you can still do nothing on the site.

The humor of the parody comes in substituting Facebook, a site that, at the time this comic was made, was a useful and popular website; for Zombo.com, a novelty site which gained attention for its complete uselessness.

You can visit the site at [zombo.com](http://zombo.com).

The last four panels are all direct parodies of specific scenes from *The Social Network*. The second panel is a

takeoff of the scene where Facebook founder Mark Zuckerberg comes up with the idea for the site, saying that people like checking up on their friends and acquaintances, so why not build a site that lets them do that? Because Zombo.com has no actual function, in this version the founder can't specify what he wants the site to do.

The third panel is taken from a scene where Zuckerberg is seen intensely focused on programming the site, his headphones insulating him from the outside world. His assistant describes his state as "wired in" and demands that he not be disturbed. In the comic, as Zombo.com is a very simple site which does not need much coding, the assistant offers the possibility that the founder is stoned. Indeed, it's one of the few conceivable reasons that one would be this focused on such a useless website. As "the infinite is possible" is a phrase in Zombo.com's audio clip, it is also plausible that the founder is currently recording the clip, and the assistant is telling the others not to bother him for fear of adding background noise to the clip.

The fourth panel is taken from a scene where co-founder Eduardo Saverin tries to push for monetization of Facebook, while investor and consultant Sean Parker argues against. The actual dialogue is "You don't even know what the thing is yet. How big it can get, how far it can go. This is no time to take your chips down. A million dollars isn't cool, you know what's cool? A billion dollars." Here, instead of a billion dollars, the Parker character argues "Circles," playing off

Zombo.com's un-lucrative nature and the silliness of the design.

The final panel is taken from a scene where Parker advises Zuckerberg to change the name of the site from TheFacebook to just Facebook, calling it "cleaner." Here, he advises to change the name of Zombo.com to just Zombocom. Why the website is pronounced "Zombocom" rather than the more expected Zombo Dot Com is a mystery known only to its creators; perhaps, like in the movie, they also considered it cleaner.

The title text is a reference to a quote from the movie, specifically a conversation between Zuckerberg and Delpy (Zuckerberg is the first quote). In the actual film, Zuckerberg answers "twenty-two thousand" rather than just "twenty-two". This is a joke to the effect that, back in 1999, there weren't really that many people on the internet, and very few of them would have gone to Zombo.com.

## #856: Trochee Fixation

February 04, 2011

WE'D BEEN SEEING THIS BRAIN DAMAGE FOR YEARS, BUT ONLY RECENTLY DID OUR LINGUISTS IDENTIFY THE PATTERN BEHIND IT.

ROBOT NINJA! PIRATE DOCTOR LASER MONKEY! NARWHAL ZOMBIE BADGER HOB0 BAC0N KITTY CAPTAIN PENGUIN RAPTOR JESUS!



THE PATIENTS FIXATE ON ANIMALS AND TYPES OF PEOPLE WHOSE NAMES ARE *TROCHEES* (TWO SYLLABLES, WITH THE ACCENT ON THE FIRST).



THE MALFUNCTION CAUSES A RUSH OF DOPAMINE WHENEVER THESE TROCHEES ARE HEARD OR SPOKEN.



THE WARNING SIGNS APPEAR IN CHILDHOOD:

YEAH! MIGHTY-TEENAGE MORPHIN' NINJA POWER MUTANT TURTLE RANGERS!



SOCIAL REINFORCEMENT FOCUSES THE FIXATION ON A FEW DOZEN WORDS.

IS THERE A CURE?

WE'RE ABOUT TO RIP OUT HER TRY A RADICAL VOCAL CHORDS? TROCHEECTOMY. I'M IN FAVOR.

NO, WE'RE MODIFYING HER VOCABULARY\* TO ERASE THE WORDS SHE'S FIXATED ON.



\*DIGITONEUROLINGUISTIC HACKING! IT'S TOTALLY REAL! ASK NEAL STEPHENSON.

EITHER THE GAP WILL BE FILLED BY NORMAL WORDS, OR SHE'LL JUST GENERATE A NEW SET OF TROCHEES. HERE GOES.



... GZZHRM? ...

... BANDO TURTLE!

JETPACK FERRET PIZZA  
LAWYER! DENTIST HAMSTER  
WOMBAT PLUMBER TURKEY  
JESTER HINDU COWBOY  
HOOKER BOBCAT SCRAPPLE!



SIGH.

TIME FOR PLAN B.

SOMEONE GET A BRICK.

If you Huffman-coded all the 'random' things everyone on the internet has said over the years, you'd wind up with, like, 30 or 40 bytes \*tops\*.



## Explanation

A trochee is a type of poetic foot. A foot is a measure in poetry; it consists of stressed beats and unstressed beats. A trochee is a foot that consists of one stressed beat followed by an unstressed beat. "Trochee" itself is an example of this as you stress the first syllable and don't stress the second syllable ("TROH-kee".)

Trochee fixation is supposedly caused by people experiencing rushes of dopamine when they hear or speak trochees during their youth. Due to the rush of dopamine, they become more fixated on trochees. In the endless quest for dopamine, they continue to search for trochees (typically on the internet) while also producing more places to encounter trochees meaning more fixation for others with the disorder. Megan proposes a "radical trocheectomy" which appears to be a type of psychosurgery due to the erasing of memory. Cueball misinterprets Megan's intent as a "tracheotomy", which he mistakenly believes to be a removal of Jill's vocal cords, of which he is in favor.

Megan proceeds with the trocheectomy, but luckily it does not have the intended effect. Though the previous trochees have been forcefully and unkindly removed, Jill immediately generates new ones: "BAN-jo," "TUR-tle," "JET-pack," "FER-ret," and so on. The correct way of removing the fixation would be to alter mesolimbic pathway. Megan, not realizing this, succumbs to attempting to removing her trochee fixation via cranially

applied brick. Depending on how hard Jill is hit with the brick she may have memory loss and potentially forget all the trochees she knows, but if this method is carried out, she will have significant brain damage and will likely start fixating on trochees that she hears.

There are references to Teenage Mutant Ninja Turtles and Mighty Morphin' Power Rangers, both of which are examples of actual, trochaic TV show titles. Additionally, there is a reference to sci/fi author Neal Stephenson who has written Snow Crash, Anathem and many other books.

"Jetpack ferret" could be a reference to 20: Ferret, although the ferret in question only had wings.

Huffman coding is a lossless data compression algorithm that works by organizing characters into a tree structure (called a Huffman tree) with the most used characters in a string closer to the top. The characters in the string are then replaced by the sequence of bits representing their place in the tree, allowing for characters that are used very often to be represented with only a handful of bits compared to the 16 or 32 bits usually needed (depending on the character set used). In highly repetitive data this can cut down the file size immensely, which is what Randall is implying by saying you would only end up with 30–40 bytes. Most of the "random" stuff said on the Internet has been said before, and isn't particularly random either, following predictable patterns.

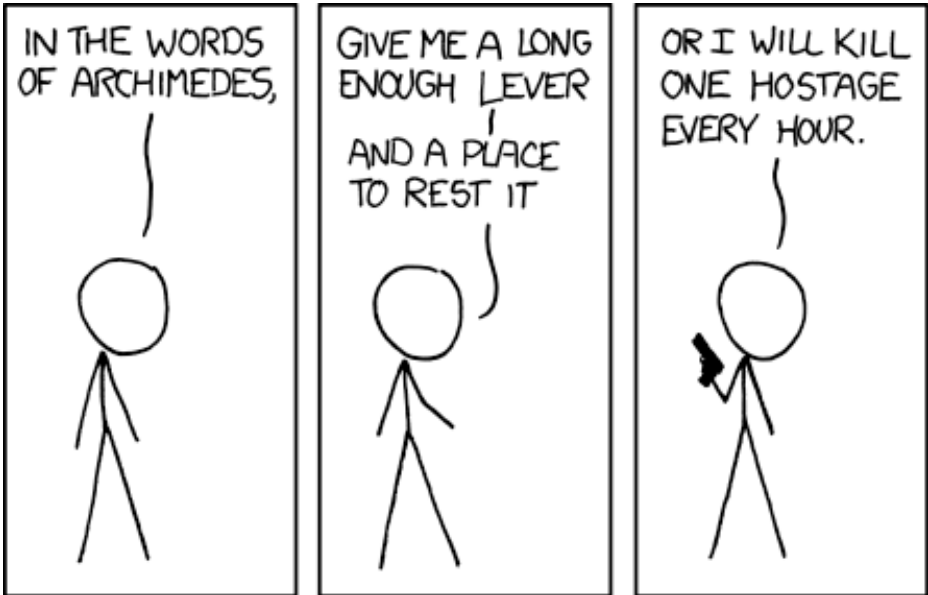
Trochee and other types of poetry "feet" is the subject of

1383: Magic Words, and the trochaic form is explored further in 1412: Teenage Mutant Ninja Turtles.

On the blog, Randall published statistics about the occurrence number of certain combinations (now obviously inaccurate).

## #857: Archimedes

*February 07, 2011*



Give a man a fish, or he will destroy the only existing vial of antidote.

## Explanation

This comic references a famous quote made by Archimedes: δῶς μοι πᾶ στῶ καὶ τὰν γᾶν κινάσω, which could translate as "Give me a long enough lever and a place to rest it, and I will move the Earth". Archimedes was illustrating the power of force multiplication by stating that, in theory, even a mass as immense as the entire planet Earth could be moved by a single human being using a simple lever.

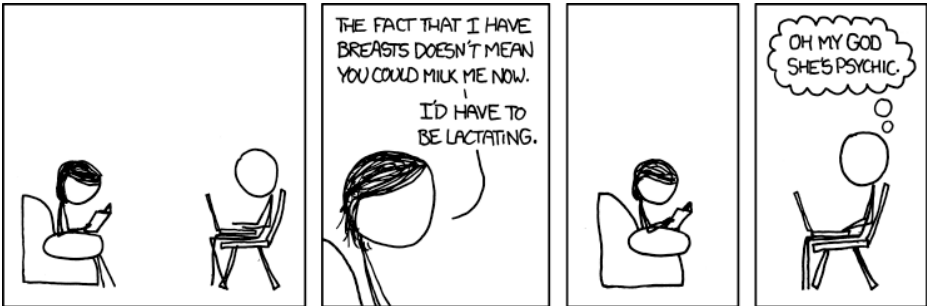
While Archimedes is theoretically correct, in practice the lever would need to be millions of light years long, and the person operating it would need to push it by several light years to move the Earth even a microscopic amount. In fact, a much simpler way to move the Earth, which achieves similar distances, is to jump in the air - by Newton's third law, the same amount of force that is applied to you will also be applied to the Earth.

Here, Cueball begins as if he is quoting Archimedes, but then produces a gun and threatens to execute hostages if he does not receive the lever, indicating that he is, for some reason, actually trying to enact Archimedes' thought experiment for real. This may be a stealth pun on the term "leverage", as the threat of killing hostages is used to provide leverage to have the hostage taker's demands met. Of course, the leverage provided by a physical lever and the concept of leverage in terms of a negotiation are two wildly different ideas despite the similar name.

The title text references another famous proverb, "Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for a lifetime." The quote starts out the same, but again ends with a sentence that is more fitting for an action movie.

## #858: Milk

February 09, 2011



It's not hard when you have the same thought like 40 or 50 percent of the time.

## Explanation

Megan and Cueball are sitting quietly, engaged in their own solo pursuits. Without any preamble, Megan answers a question that has not been asked, pointing out to Cueball that he would not be able to obtain milk from her breasts right now, as she is not lactating. Cueball is flabbergasted that she seems to have read his mind, as this was exactly what he was wondering.

Megan, like any healthy adult female mammal, is capable of producing milk from her mammary glands. She does not need to be pregnant in order to lactate; some women are able to lactate before getting pregnant, but being pregnant will increase the chances of her being able to lactate.

The title text indicates that this is not proof of Megan's psychic powers, as Cueball seems quite obsessed with this particular topic, although, if you interpret it as a response to Cueball's thoughts in the last panel it could remain ambiguous.

Alternatively it could mean that Megan and Cueball are having the same thoughts 40 or 50% of the time and thus it's actually easy for her (or actually both) to guess his thoughts.



#859: (

*February 11, 2011*

(AN UNMATCHED LEFT PARENTHESIS  
CREATES AN UNRESOLVED TENSION  
THAT WILL STAY WITH YOU ALL DAY.

Brains aside, I wonder how many poorly-written  
xkcd.com-parsing scripts will break on this title (or ;'"<<['  
this mouseover text."

## Explanation

First off, allow us to resolve those pieces of tension which have been left unresolved by this comic. ]>> } ) ) ) ). Okay, with that out of the way, let the explanation begin.

In programming, punctuation is often used to mark sections of code. Paired punctuation marks must always be matched up with a corresponding closing mark, otherwise a so-called syntax error occurs. The programming language Lisp (also featured in 224: Lisp is known for large numbers of nested/paired parentheses. Even in literary works intended only for human consumption, the absence of a matching closing parenthesis as appears in this sentence or other "balanced" punctuation sets creates a mental expectation of eventual closure and completion that remains unfulfilled even long after the unmatched mark is encountered.

There is also a reference to 312: With Apologies to Robert Frost which could contain the missing parentheses.

It can also be interpreted as a metaphor, which compares the reader with a Lisp interpreter. The interpreter looks for the parenthesis until the end of the file, where it eventually halts, and prints out the error. The comic claims that if you read an unmatched parenthesis, you will look for it for the rest of the day too.

It also refers to an awkward feeling when you see something out of place in a piece of literary text (like unmatched parentheses, spelling error or a randomly-plac,ed comma..

Also, it may refer to OCD.

Finally, some countries (Russia in particular) use just parentheses instead of text smileys so that :( becomes ( and :) turns into ), and it's even somewhat common to stack multiple smiles together in such cases like))). Hence those readers can magically resist the unresolved tension of the comic but may feel a bit sad instead as a side effect, although the parenthesis is placed in the beginning and not in the end as usual.

The title text refers to the same issue as already highlighted in 327: Exploits of a Mom: if your scripts trust external input, you sometimes will be surprised. At the time of this comic, there were quite a few websites that would grab the xkcd comic three times a week and publish them on their own site. This comic likely broke at least some of the websites because of either the unmatched paren or the extra unmatched markup that is in the title text.

## #860: Never Do This

February 14, 2011



I call Rule 34 on The Secret House.

## Explanation

Cueball shows his new pocket microscope to Megan. With the curiosity of scientists, they quickly decide to use the microscope to look at a number of different things.

But after they use the microscope to inspect what is under their fingernails, they're both aghast at what they find and curl into fetal positions. Our fingers are how we interact with the world, and all manner of things get trapped under our fingernails; different kinds of dirt, fungus, spores, fragments of insects, insect droppings and so on. Such things that obviously look pretty horrific when magnified a few hundred times. Cueball and Megan never suspected what they would find, and seem unable to process or deal with the horror they have uncovered.

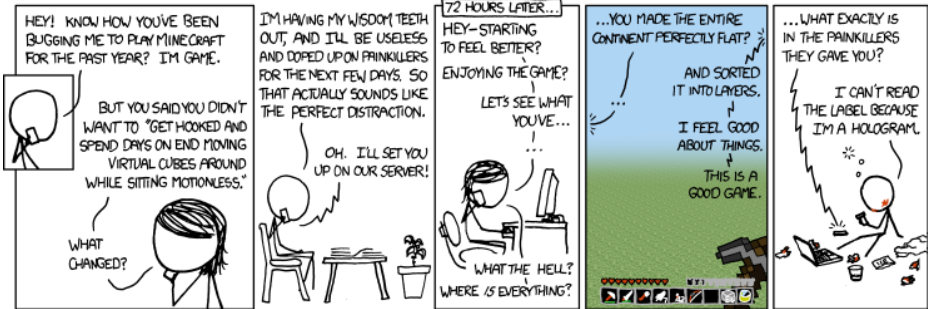
The title text refers to Rule 34 (see 305: Rule 34), an internet meme which states "If it exists, there is porn of it. No exceptions.". The book referenced is "The Secret House: 24 hours in the strange & wonderful world in which we spend our nights and days" by David Bodanis and is a study in microphotography. It features extreme close-ups of everyday phenomena in the common house, but as seen from a microscopic perspective. "Rule 34" states that there must be porn of this nature, but it is not clear what form this would take; it could be lewd drawings of personified microscopic objects, or perhaps just images of individual sperm cells.

Randall may have done this check himself - and now chooses to warn others not to make the same mistake. Thus, the title: Never Do This. He later gives the same type of advice against using a UV lamp in the bathroom through this comic: 1469: UV.

Given his likely negative feelings towards Valentine's Day, as seen in the most of his Valentines comics, it may not be a coincidence he send this gross comic out on February 14. He did not draw any Valentines related comic this year as he for instance did the two years before and the year after.

## #861: Wisdom Teeth

February 16, 2011



I heard the general anesthesia drugs can cause amnesia, so when I woke up mid-extraction I started taking notes on my hand so I'd remember things later. I managed 'AWAKE BUT EVERYTHING OK' before the dental assistant managed to find and confiscate all my pens.

## Explanation

Wisdom teeth, as many people are no doubt painfully aware, are the third set of molars found in humans. Because human jaws are smaller than other ape jaws, most of us don't have room for a third set of molars, and the teeth become impacted so they grow straight into the other teeth, requiring a painful, debilitating procedure to remove them.

Because recovering from dental surgery often entails a period of rest following the operation and the use of prescription painkillers (which have a tendency to make a person go a little loopy),[actual citation needed] Cueball prepares to play Minecraft the entire time. Minecraft is a PC game known for its addictive qualities; the game itself primarily revolves around a three-dimensional world in which the goal of the player is centered on the aspects of structural creation using blocks found in the environment and the creation of different materials for use in building these structures. Despite its addictive nature, the game doesn't provide the player with a goal, so most people take to building lots of nifty stuff, such as large cities, computers made from the game's built-in redstone (electricity) mechanics, massive scale replicas of Earth, etc.

Cueball's conversation with Megan indicates that he has previously decided against playing Minecraft precisely due to its addictive gameplay and lack of internal goal, deeming it unproductive. However, 'productivity' is not



something that Cueball believes he can achieve post-extraction, and so Cueball decides that addictive gameplay and lack of internal goal "sounds like the perfect distraction".

Unfortunately for Megan (and any other users of her server), Cueball, while intoxicated with painkillers, has instead opted to flatten an entire continent and sort it into layers (by type of block, presumably). While there's no real indication of how big the continent is, as Minecraft worlds are randomly generated, sea level in Minecraft is at Y level 64, which means he sorted at least 65 layers of a continent large enough to be sufficiently developed, so it is clear that this task would take a lot of time. Collecting a block in Minecraft takes a certain minimum amount of time, depending on the block type, so even if he did everything as fast as he possibly could, there's still a substantial lower bound.

Ironically, in the second panel Megan says she'll set Cueball up on her server, which indicates she probably uses a whitelist to secure the server from griefers who might destroy structures created by others, not expecting that Cueball would do exactly that. The last panel simply illustrates that painkillers tend to make one loopy.

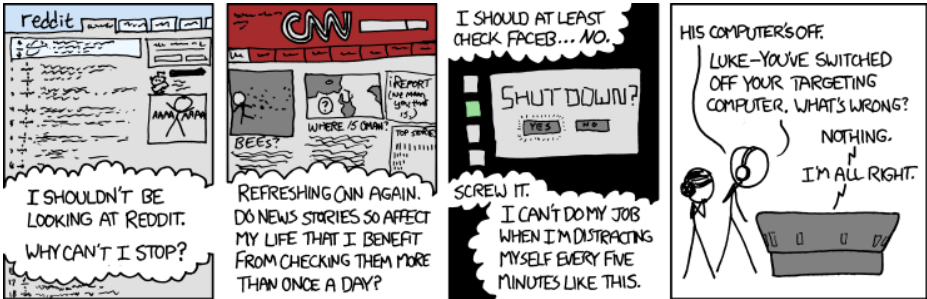
The title text refers to people waking up during surgery. Because anesthesia requires a lot of careful calibration and dosage - there's a reason anesthesiologists are paid hundreds of dollars an hour to be there, after all - it's possible to sometimes get it wrong, resulting in the patient waking up in the middle of the surgery. The three

most important parts of anesthetics used for surgery are an analgesic (blocks pain), a sedative (puts you to sleep), and a paralytic (keeps you from moving). The worst-case scenario that most people hear about is when the analgesic and sedative are under-dosed, but the paralytic is correct, leaving the person awake, able to feel pain, but unable to alert the surgeons that anything is wrong. As a result, some countries and medical institutions have passed laws requiring surgeons to monitor brain activity so that these problems can be quickly remedied. The situation the title text is describing, with both the sedative and paralytic wearing out (leaving the person able to write notes), would be quite unlikely. As for confiscating all the pens, it was probably just to keep the patient from disturbing the procedure while the anesthesiologist corrected the dosage.

Sorting a Minecraft world into layers like this would be a near impossible task, especially in the version of Minecraft (Beta 1.2) that was current when this comic was released, which did not even include the enchantment system that allowed for tools that could mine exceptionally fast, meaning that even the sheer time to mine out such a large area would be astronomical, not even considering the time to replace the blocks in proper layers, or to gather resources for the many tools you would need. In later versions of Minecraft, it is possible to naturally generate worlds that resemble the world in this comic using the "superflat" world generation mode, but this was not a feature in Minecraft when this comic was released.

## #862: Let Go

February 18, 2011



After years of trying various methods, I broke this habit by pitting my impatience against my laziness. I decoupled the action and the neurological reward by setting up a simple 30-second delay I had to wait through, in which I couldn't do anything else, before any new page or chat client would load (and only allowed one to run at once). The urge to check all those sites magically vanished--and my 'productive' computer use was unaffected.

## Explanation

It is human nature to lose interest in difficult or boring tasks, and instead do something easier, more interesting or more rewarding in the short term. While procrastination and distraction from more important tasks has always been present, this comic casts a light on the internet and the huge potential for distraction which it provides.

The first two frames in this comic are the set-up, and contain the websites CNN and Reddit and thoughts over the top of them. These types of websites that are regularly updated with new content are prime candidates for distraction. The thought bubbles indicate that the reader is fully aware that they shouldn't be looking at these websites, but is unable to stop himself. Even the very rational thought that checking news stories more than once a day is bordering on pointless doesn't seem to stop him.

In the third frame, it starts to look a little different as the screen is not a computer but is in fact the targeting computer from Luke Skywalker's X-wing. At this point it becomes clear that there are far more important tasks at hand, namely flying the craft. Even then, Luke has an internal conflict and considers checking Facebook, but mentally checks himself, and to prevent himself from further compulsive browsing shuts down the system. The thought bubble at the bottom is one that is probably familiar to many people (especially students), where he

realizes that he has to turn off the computer to actually concentrate on the important task.

In the fourth frame, we finally get the movie reference from Star Wars as Princess Leia and one of the Rebel Alliance's officers are gathered around the holographic table that allows them to follow the battle. In the movie, Luke turns off his targeting computer because he uses the force to fire the torpedoes at the right time. But in this comic, Luke turns off the computer because he keeps getting distracted by Reddit and CNN. When they ask whether he is alright, he responds in the way most people would who have nearly been caught wasting time on the internet. This is however a quote of what he actually replies in the movie.

See the Destruction of Death Star scene on YouTube. The Let Go remark from Obi-Wan Kenobi that had given the title to this comic occurs about two minutes into the clip. Though here it is a reference to let go of refreshing websites...

The headlines on CNN read 'Bees?', 'Where is Oman?', and 'iReport (we mean you, that is.)'.

The headline Bees? cannot be a reference to Cards Against Humanity because it came out a few months after this comic. It probably is just a question to the picture above - if it was bees following the guy.

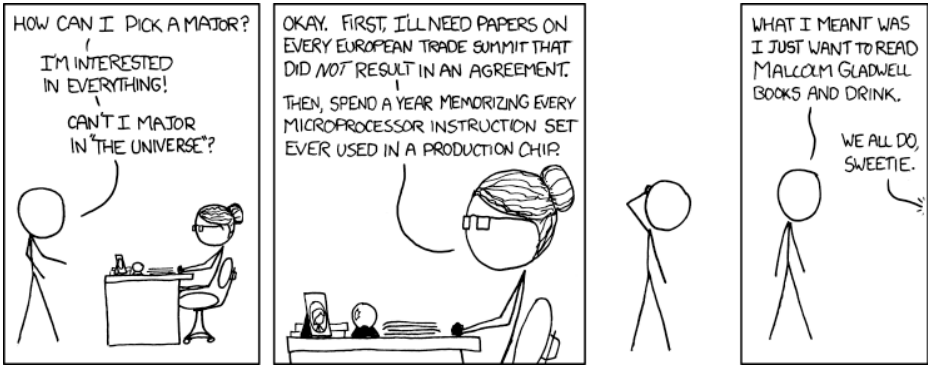
The headline Where is Oman? is below a map where land is white. It shows Cyprus, Northern Egypt and the

Middle East with the Mediterranean Sea, the Red Sea and the Persian Gulf (seas are grey). Oman is not on this map as it is not situated on the Persian Gulf; it's on the Gulf of Oman and on the Arabian Sea, both of which can be considered parts of the Indian Ocean.

The title text is a serious solution to a procrastination problem that we see in the comic, later explained to take the form of simply rebooting the computer. Randall just used the honor system, rather than enforcing this behavior with a program, but he solicited suggestions from his commenters for browser addons, for people who could not simply reboot their computers for whatever reason. At the time, a commenter suggested DelaySites, but that addon is no longer available; nowadays, Mozilla recommends LeechBlock NG (also available for Chrome), which can be configured to implement the loading delay or block websites entirely, with additional parameters for adjusting time limits for browsing and the time of day and days of the week that each behavior is active.

## #863: Major in the Universe

February 21, 2011



I hear Steven Levitt is writing a book analyzing A.J. Jacobs' quest to spend a year reading everything Malcolm Gladwell ever wrote. The audiobook will be narrated by Robert Krulwich of Radiolab.

## Explanation

Several authors are referenced here. Malcolm Gladwell is a Canadian author who wrote such books as "The Tipping Point", "Outliers" and "Blink." Steven Levitt is one of the co-authors of the book *Freakonomics* and the *Freakonomics* blog on NYTimes.com.

Robert Krulwich is a science correspondent for NPR (National Public Radio, for those outside of the US) and a co-host of the show *Radiolab*.

A. J. Jacobs is a journalist who immerses himself in different ideas and lives them out for periods of time. For example, he lived for a year according to all the rules in the bible literally.

In this comic, Cueball as a college student, meeting with his adviser or professor (Hairbun) trying to decide what to major in. He decides to major in "The Universe", but when his adviser details the real work required of that major, Cueball scratches his head and tells what he really means. If you have not read Malcolm Gladwell's books, their disparate parts are usually tied together by a common thread. For example, in *Blink*, a motif of intuitive judgments ties together the examples of the Getty kouros, John Gottman's marriage studies, the Millennium Challenge war game, speed dating, and Paul Ekman's FACS, to name a few. These books have been criticized for supposedly presenting an incomplete picture of such phenomena, but they are hugely

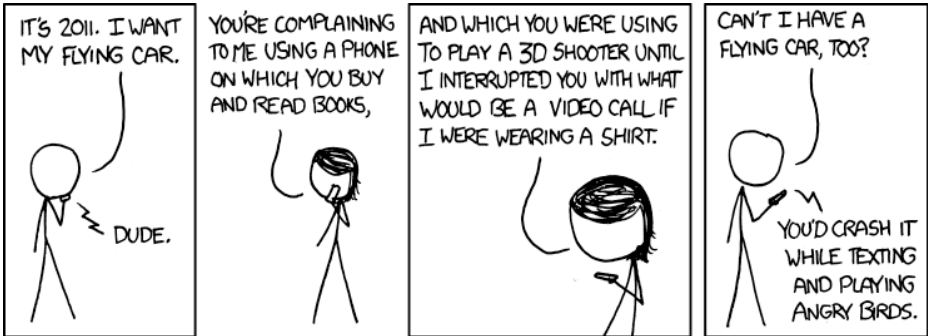


entertaining and eloquent.

Randall is making fun of people who claim to have a broad range of interests, but apparently just to deflect attention from the fact that they are too lazy to master even one field. However, the title text of Every Major's Terrible says that he will someday be the first to get a PhD in "undeclared."

## #864: Flying Cars

February 23, 2011



It's hard to fit in the backseat of my flying car with my android Realdoll when we're both wearing jetpacks.

## Explanation

Cueball is complaining to Megan, on a phone call on his smartphone, about the lack of flying cars even though it is the year 2011. This is a reference to the "where's my flying car?" joke, which is explored further in 1623: 2016 Conversation Guide, where Randall proposes that flying cars would just be helicopters.

Megan counters with the argument that phone technology has developed greatly. For example, in many science fiction movies it was predicted that by now we would have flying cars, but in the same movies the computer technology was pretty much similar to what they had achieved at the time of the movies release (see for instance Blade Runner set in 2019. Even back in 2011, very few believed that flying cars would roam the streets by then.) The flying car is still not perfected (although there are some prototypes flying today). But almost any computer technology shown in old movies pales in comparison to the current state of smartphones and other computers.

Cueball chooses to be resentful about the lack of flying cars while calling her from a phone on which he can buy and read books. He should instead be amazed at the current state of computers and communication technology. She continues to say that she even interrupted him in playing a 3D shooter game on his phone when she called him, and the call could have been a video call, had it not been because Megan chose not to

do so, since she is currently shirtless.[oh, grow up]

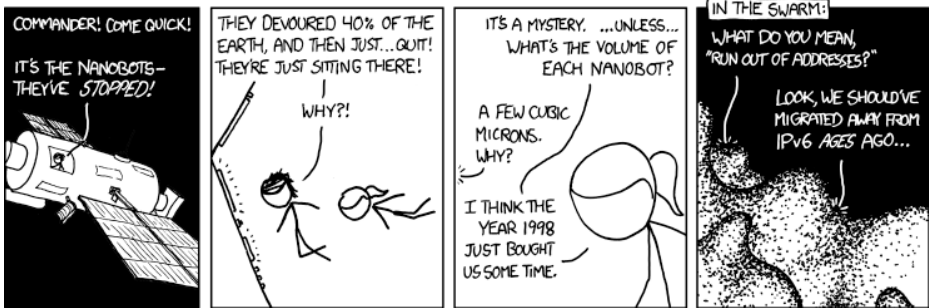
Typically, Cueball keeps fixating on the flying car. Megan assumes that if he ever had a flying car he would crash it while using his smartphone to text or play Angry Birds (a game released in 2009, two years before this comic). Given that many car accidents happens because people use their phones while driving, this seems like a realistic assumption.

The title text references RealDoll, known as "the world's finest lovedoll", but specifically an android version, which the world has yet to see. This is a direct callback to the android series. It also refers to jet packs, another invention that many people were expecting to have by this point in time. Cueball complain on in the title text that there is not enough space on the backseat of his flying car to have sex with his android girlfriend when they are both wearing their jet packs. (Maybe they would wear those for safety purposes when flying in a car while having sex... Even if it is a self-driving flying car...)

This strip is quoted at the top of the TV Tropes article I Want My Jet Pack, having a similar theme to the strip.

## #865: Nanobots

February 25, 2011



I think the IETF hit the right balance with the 128 bits thing. We can fit MAC addresses in a /64 subnet, and the nanobots will only be able to devour half the planet.

## Explanation

Megan and Ponytail are in orbit while nanobots are devouring the Earth in a swarm. This is a take on the "Grey goo" scenario in which self-replicating nanobots destroy the earth while creating more and more of themselves non-stop.

Unusually, however, the nanobots stop after devouring 40% of the planet. This is because each individual nanobot must apparently have a distinct IPv6 address, and by running out of possible addresses the nanobots cannot produce any more of themselves. With the tiny size of each nanobot, the total volume they can contain is only 40% of the Earth's mass, and they can no longer continue their consumption of the planet.

IPv6 supports approximately  $3.4 \times 10^{38}$  addresses, while the Earth's mass is around  $5.972 \times 10^{24}$  kg. Assuming "a few cubic microns" is the minimum of  $2 \mu\text{m}^3$  (according to 1070: Words for Small Sets), the nanobots would have a density of  $4 \text{ g/cm}^3$ , a bit less dense than the Earth.

This is a joke on the shortage of IPv4 addresses. The only difference is that we are on IPv4 and the nanobots are on IPv6.

1998 is when the IPv6 Specification (RFC 2460) was published and IETF is the Internet Engineering Task Force.

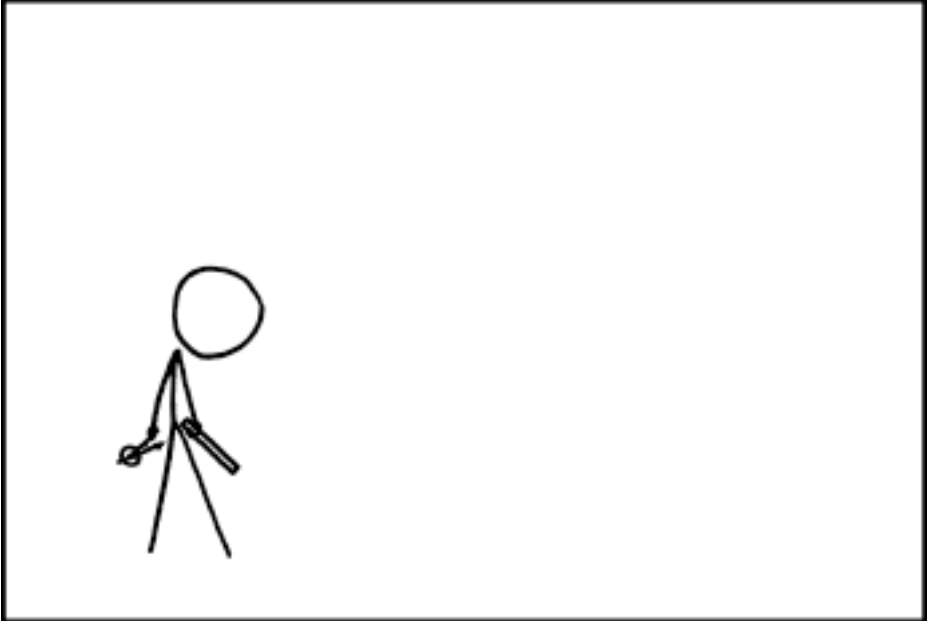
Note that an April Fools' joke for IPv9 exists and would

have guaranteed Earth's doom in this comic's scenario.

## #866: Compass and Straightedge

*February 28, 2011*

I LEARNED IN HIGH SCHOOL WHAT  
GEOMETERS DISCOVERED LONG AGO:



USING ONLY A COMPASS AND STRAIGHTEDGE,  
IT'S IMPOSSIBLE TO CONSTRUCT FRIENDS.

The Greeks long suspected this, but it wasn't until April 12th of 1882 that Ferdinand von Lindemann conclusively proved it when he constructed himself the most awesome birthday party possible and nobody showed up.



## Explanation

Compass and straightedge constructions are a class of problems in classical geometry. They take the form "Using only a compass and a straightedge, construct X", where X is a geometric figure such as a regular pentagon. The subject is typically covered in high school mathematics. Three such constructions (squaring the circle, trisecting the angle and doubling the cube) remained unsolved for thousands of years before being shown impossible with the use of modern algebraic techniques.

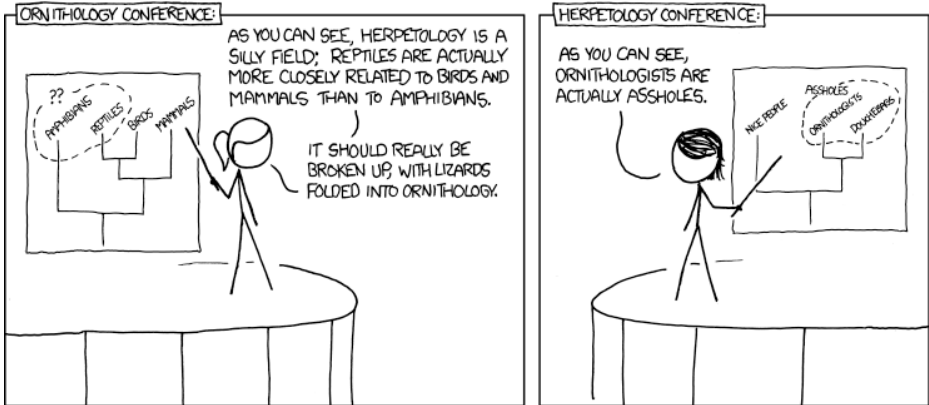
The comic begins as if it were stating a problem in classical geometry but veers into an observation that no amount of technical knowledge can substitute for human companionship. An additional layer of humor is that Cueball is a stick figure so technically it is possible to create friends with a straightedge and a compass, a figure constructed like Cueball is. Yet two other layers are the reference to the "straight edge" subculture that believes that one can find fun, friends and partners without alcohol and drugs and the fact that it claims one can construct a awesome birthday party using only two means that together often fail to construct even simple geometrical objects.

Ferdinand von Lindemann was a German mathematician who showed in 1882 that  $\pi$  is not a zero of any polynomial with rational coefficients, i.e. it is a transcendental number. Transcendental numbers cannot

be constructed with straightedge and compass. This proves that squaring the circle (a problem where it is required to construct a square with the same area as a given circle) is impossible, being as the sides of the square would need to be  $\sqrt{\pi}$  times the radius of the circle, and  $\pi$  is not constructible.

## #867: Herpetology

March 02, 2011



Birds are Aves, which is part of the clade Theropoda, which is in Saurischia, which is in Dinosauria. Those birds outside our windows are dinosaurs. We can clear out the rest of our brains because we now have the best fact.

## Explanation

Herpetology is the branch of zoology that studies reptiles and amphibians. Ornithology is the branch of zoology that studies birds.

At an ornithology conference, Ponytail is using the Cladistics method by showing a Cladogram to argue that the combining of amphibians and reptiles into a single field of study is misguided. In terms of their evolutionary history, reptiles are more closely related to birds (and even to mammals) than to amphibians. She states, in a patronizing way, that the study of reptiles should more properly be combined into her own field.

Herpetologists would rightly see this view as a threat to their territory, their budgets and even their existence.

The claim made by the ornithologist is fundamentally correct; the evolutionary history of those groups did actually diverge in that way. So, instead of arguing the science, Megan, the presenter at the herpetology conference resorts to a personal attack on the profession of ornithology. At their own conference, they retaliate with a chart that purports to demonstrate that douchebags and ornithologists are more closely related to each other than either are to nice people, and they can therefore be grouped into an encompassing asshole classification.

Since the intent of the earlier presentation was

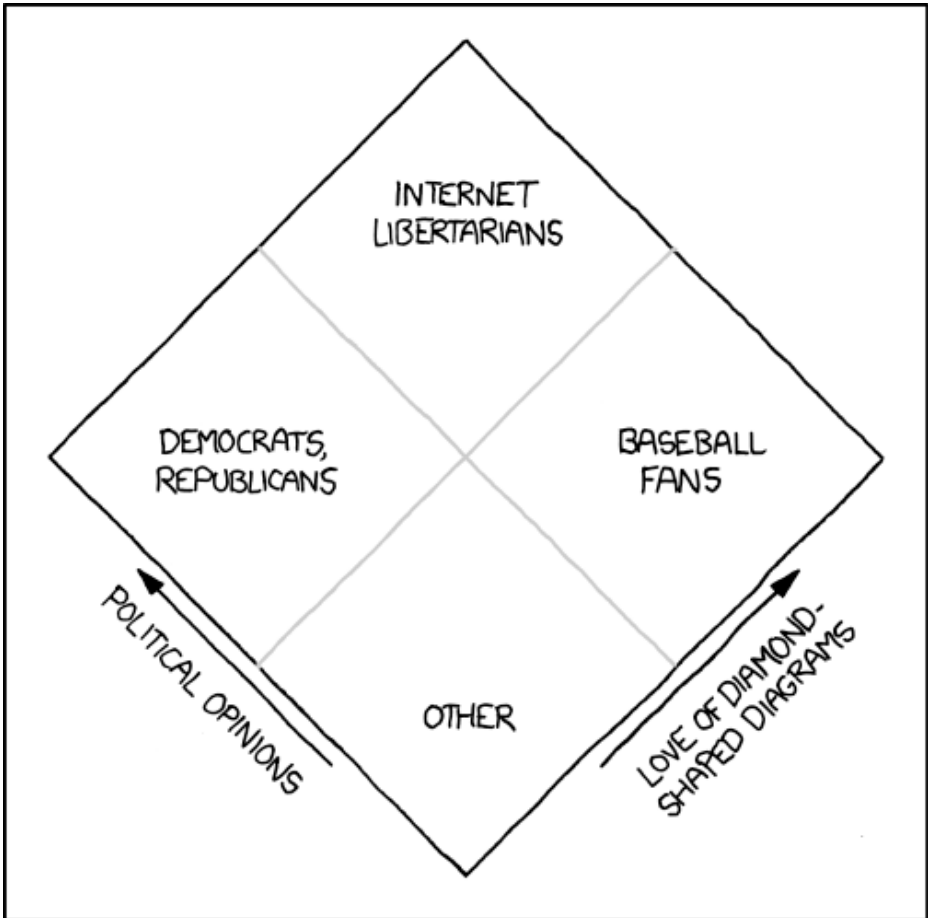
presumably to rile herpetologists rather than achieve any particular scientific goal, this response seems appropriate.

In the title text, birds are class Aves which is a subset of the suborder Theropoda which is a subset of the order Saurischia and the superorder Dinosauria. Under the normal rules of classification, this means that all birds are technically dinosaurs.

This was also shown in more detail later in 1211: Birds and Dinosaurs.

## #868: Nolan Chart

*March 04, 2011*



Also in the right quadrant are NFPA-compliant chemical manufacturers and Sir Charles Wheatstone. Sharing the top with the internet libertarians are Nate Silver and several politically-active kite designers.

## Explanation

The Nolan Chart is a visual representation of the political spectrum that measures not only liberal vs conservative tendencies but also libertarian and statist tendencies. Libertarians tend to like Nolan Charts because they feel that the Democratic/Republican spectrum, the most common visualization of political beliefs, isn't nuanced enough to explain libertarian beliefs.

In this comic, it is taken to a different end. On one side are both Democrats and Republicans and on the other side are baseball fans. In the typical Nolan Chart, Libertarians are in the top quadrant, but in this one "Internet Libertarians" take the spot because they love the Nolan Charts (which are found online) and have a lot of political opinions.

Nolan may also refer to baseball Hall of Famer Nolan Ryan.

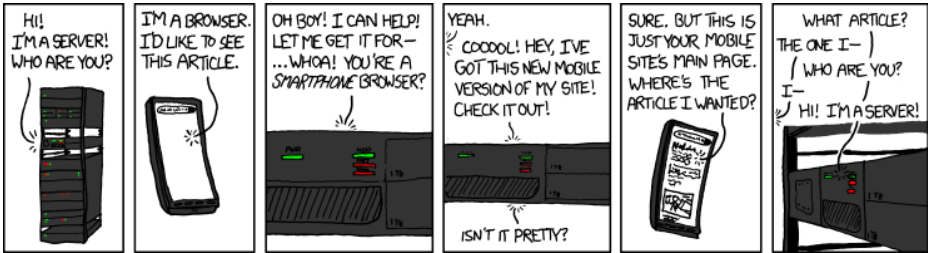
In the title text, the NFPA-compliant chemical manufacturers are mentioned because of this diagram. Sir Charles Wheatstone was the inventor of the Wheatstone bridge, which is also diamond-shaped. The title text also refers to Nate Silver, who previously worked for Baseball Prospectus and now writes a data-driven political and sports blog called FiveThirtyEight for ESPN. He is both a lover of diamond-shaped diagrams (baseball) and has political opinions. Politically-active kite designers both

would have strong political opinions (it comes with the territory of being politically active) and would love diamond-shaped diagrams, presumably because they would be interested in blueprints of kites.



## #869: Server Attention Span

March 07, 2011



They have to keep the adjacent rack units empty. Otherwise, half the entries in their /var/log/syslog are just 'SERVER BELOW TRYING TO START CONVERSATION \*AGAIN\*.' and 'WISH THEY'D STOP GIVING HIM SO MUCH COFFEE IT SPLATTERS EVERYWHERE.'

## Explanation

The comic shows - in human language - part of the conversations that a browser and web server do in order to get the right page. The protocol they use is called HTTP.

This comic makes fun of the issues that would arise back in the early days of smartphones days when web-servers see a mobile browser. Often, they would automatically suggest to load the mobile version of the website, but then serve the front page of the mobile site and not the page the user had requested. In quite a few sites, there would be no 1-to-1 correspondence of pages between the regular and the mobile site, so this problem is difficult to solve and very annoying. Since the date of this comic, mobile versions of websites have improved significantly, so the types of problems discussed in the comic rarely happen, although the difficulty of persuading the browser and/or server to not customise web-pages for mobile usage (e.g., assuming the display is going to be in portrait orientation, so restyling it accordingly) is often a continuing problem. As are the continual intrusive popovers 'suggesting' the reader might wish to install (or open) the dedicated 'app'.

A second issue with HTTP is identified in the last panel. HTTP is a stateless protocol. After serving the web page, the connection is severed. Any new request for a page will have to start afresh - which is where the server starts with again: "Hi! I'm a server!" Of course, browsers do not

have egos nor do they hold grudges[citation needed] but it can be annoying for users. This design issue can also slow down the browsing experience.

The title text is a joke that all the other servers in the rack would think the web server is being childish. `/var/log/syslog` is where Linux (used by the vast majority of servers) and other POSIX systems store their system log messages. The 'trying to start conversation' comment is probably a joke on ARP discovery packets that are sent out to the network to see who is who. All servers send out ARP packets to see what other machines are on the network, but some machines send them out every 5 minutes, which can be extremely annoying for someone monitoring network traffic logs. The server rack shown has the machine involved set in a deliberate gap in an otherwise packed rack, which occasionally can be done for ventilation purposes (although this can also be disadvantageous to airflow in a closed-door cabinet) or for other organisational/logistical purposes, though physical position rarely actually matters for operational purposes as much as which cables and installation configuration it uses. In this case, however, the spacing is apparently so that there are no similarly anthropomorphic adjacent machines forced to closely listen to this server's inanely simple and over-cheery chatter.

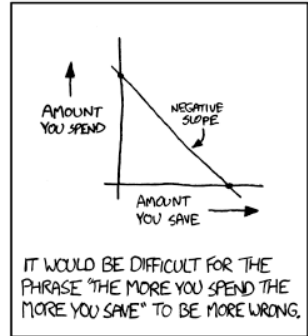
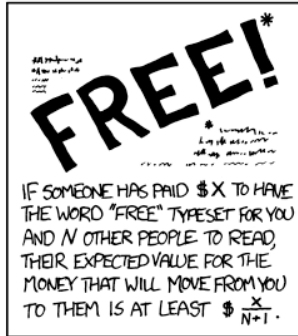
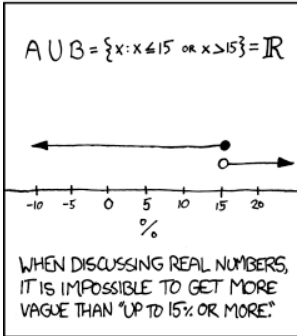
The coffee comment is another jab at web servers. Some websites use Java, or other JVM based languages (Apache Groovy, Scala, etc.) as the back end of the website, as opposed to using PHP or ASP. Of course, java is another

word for coffee (moreover, the logo of Java is a cup of coffee), so a web server running on coffee is likely to be well-caffeinated, and well-caffeinated people tend to bounce off the walls with enthusiasm.

## #870: Advertising

March 09, 2011

### MATHEMATICALLY ANNOYING ADVERTISING:



I remember the exact moment in my childhood when I realized, while reading a flyer, that nobody would ever spend money solely to tell me they wanted to give me something for nothing. It's a much more vivid memory than the (related) parental Santa talk.

## Explanation

This comic pokes fun at millions of advertising tricks, analyzing them mathematically.

### First panel[edit]

The phrase "up to 15% or more" is examined, and shows to encompass all real numbers. While intended to entice to customer with savings of 15%, the savings could be lower or even not at all. The phrase ultimately means "less than, equal to, or more than 15%," which is true no matter whether you save anything or not (it's a tautology). The equation at the top of the panel expresses the same thing using set theory notation. It reads out as: The union of sets A and B equals the set of all x, such that x is less than or equal to 15, or greater than 15, which equals the set of all real numbers.

The same is expressed again with a number line; the numbers being interpreted as percentages. The first range, ending with a black dot, indicates that everything below, as well as the number 15, is included ("up to 15%"). The second range beginning with a white dot indicates that it only includes numbers strictly bigger than 15 ("more than 15%"). The two ranges combined clearly cover the entire number line.

(The way humans interpret language, as well as the realities of economics, makes this expression somewhat more meaningful in practice. No reasonable consumer would experience savings of 0% or less from such a promotion [as they would instead simply stick with whatever they'd been using beforehand], and the phrasing of "up to 15%" as the primary portion of the phrase

implies to a human listener that they'd be most likely to get some positive amount of savings between 0% and 15%, with the secondary "or more" interpreted as referring to a lesser chance of a greater reward. Thus, in practice, "up to 15% or more" would be interpreted as meaning that most consumers would be able to realize positive net savings of approaching 15%, with a lucky few getting savings in excess of 15%.)

The phrase "up to 15% or more" may be a reference to the Geico slogan at the time: a phone call lasting "15 minutes could save you 15% or more on car insurance." However the reference is unclear, as the words "up to 15%" are not actually used by Geico. Though Geico's advertising is also referenced in 42: Geico.==

## **Second panel[edit]**

Whatever is advertised with a big capital "FREE!" splashed over the ad, most likely does not belong to the things truly free. The small asterisk, indicates the presence of a fine print, ensuring that the advertisers are only technically not guilty of false advertising. The conditions attached in the fine print typically reveal how they will (try to) make money from you.

We are even given a little formula to calculate the average amount of money they expect to make from the readers. The assumption is that they expect to generate at least as much income from the ad as what they paid to print and publish it in the first place.

(It should be noted, however, that, in many, if not most, cases, it is possible, with some careful examination of the fine print, to partially or completely dodge the seller's attempts to impose ancillary costs.)

### Third panel[edit]

This relates to sales tactics that are based on a scaling percentage rate - for example, all items are 20% off, but if you spend more than \$200, you get 30% off instead, and so on. These are almost universally proclaimed with a phrase like "The more you spend, the more you save!" In absolute dollar terms, this is of course nonsense, as "spending" is the opposite of "saving", and the deal is there to make you spend more. The graph shows this interpretation - spending zero money implies you have saved all your money (the dot where it intersects the X axis), whereas spending all your money implies you have saved none (the dot where it intersects the Y axis). There is a linear relationship between the two: the amount of money spent, plus the amount of money saved, has to add up to a constant number (your original savings).

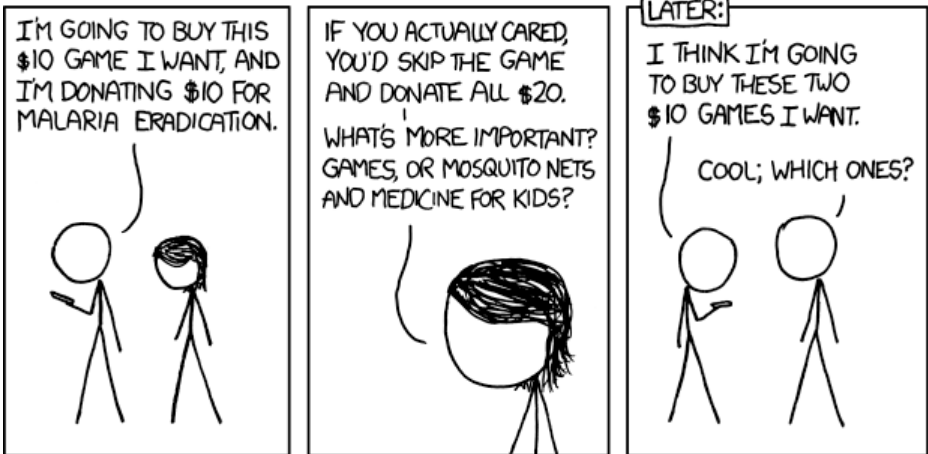
(However, if "the more you spend, the more you save" is interpreted as referring to the proportion of the list price that the consumer now doesn't have to pay due to the x%-off promotion, the expression does make sense, as the discount as a proportion of the list price does indeed increase the more you spend. For [relatively-]nonperishable goods, this makes it a good idea to take advantage of these promotions to make large bulk purchases, as the scaling discount rate makes the cost per unit of merchandise lowest for very large purchases, making these a much-more-efficient use of one's money than frequent low-volume purchases [especially as a large proportion of these low-volume purchases would be at times when there was no ongoing promotion, meaning that they wouldn't be able to take advantage of even the lesser discount rate of these promotions].)



The title text compares Randall's realization of the "FREE"-fraud to the revelation that Santa Claus is not real.

## #871: Charity

March 11, 2011



I usually respond to someone else doing something good by figuring out a reason that they're not really as good as they seem. But I've been realizing lately that there's an easier way to handle these situations, and it involves zero internet arguments.

## Explanation

Organizations such as Steam often offer sales where certain games are available for low prices--in order to compel or persuade buyers to make donations to worthwhile charities. Cueball is participating in one of these purchases (to fight malaria), but Megan's snide denigration of Cueball's act of charity as inadequate and self-serving has dissuaded him from any act of charity at all. Many people donating to charity are in fact buying a feeling that they are good people doing good things. If you take this feeling away, many people stop donating, which is shown on the third panel.

This also shows the stupidity of the situation: donating some of your money to charity can result in insults and arguments, while donating nothing at all does not.

However, whatever somebody's internal motivation was, charity is a good thing.[citation needed] Therefore the proper response is to neither care what people say about you nor attack other people's charitable giving. The action that Randall recommends here is the right one, which is to donate anyway without caring about what others say or do. Clicking on the original image leads to the website of [Nothing But Nets](#), an organization that distributes mosquito bed nets in Africa for the eradication of malaria.

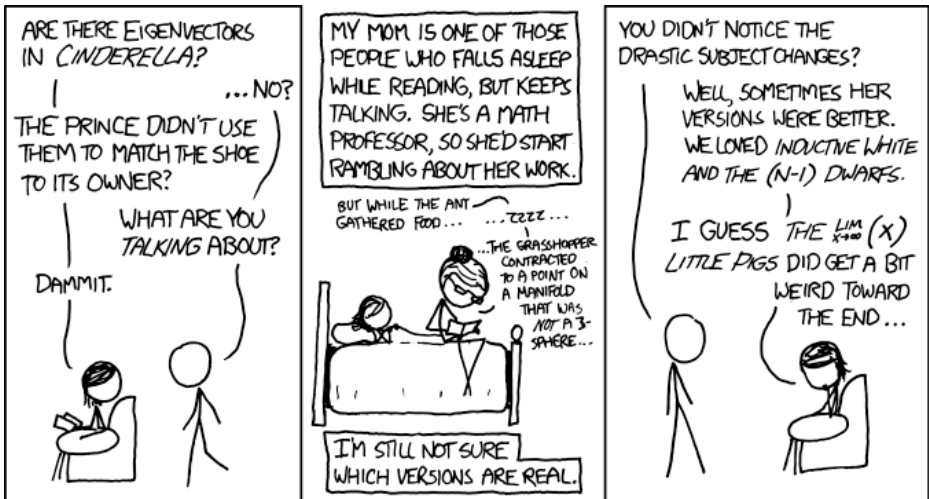
A subtext here is that the friendship between Cueball and Megan has been strained or even broken. Cueball

has picked a new friend to talk to, who reacts positively to his decision.

In the title text, Randall expresses an opinion critical of "respond[ing] to someone else doing something good by figuring out a reason that they're not really as good as they seem", in part because supporting charity shouldn't cause "internet arguments."

## #872: Fairy Tales

March 14, 2011



Goldilocks' discovery of Newton's method for approximation required surprisingly few changes.

## Explanation

Eigenvectors are a mathematical concepts that can be applied to a matrix. A matrix is mostly displayed as an rectangular array of elements used to describe the state of objects in physics. In pure mathematics they can be much more complex. The most important issue to the understanding of the comic is that a matrix can be transformed through various processes. These transformations can include rotation, movement and scaling of the object described by the matrix. An eigenvector refers to elements of the vector space of the matrix which remain unchanged (except possibly being scaled to be longer or shorter) after the transformation is applied. The prefix 'eigen-' applied to the term is adopted from the German word eigen for "self-" or "unique to", "peculiar to", or "belonging to." As the eigenvector remains unchanged through the transformation of the matrix it can be used to describe something unique about that matrix.

The story of Cinderella includes Cinderella going to a ball in disguise, dancing with a prince and then leaving early and quickly, so that she accidentally leaves a glass slipper behind. The prince then uses the shoe to find Cinderella. Megan says that the way she learned it, the prince used an eigenvector and corresponding eigenvalue to match the shoe to its owner.

Eigenvectors are a basis of statistical Principal component analysis, a procedure in which a set of points

in  $N$ -dimensional space (each of which represents an observation) is rotated in such a way, that the cloud of points has its largest extent along the  $X$ -axis, then along the  $Y$ -axis, and so on. The prince could probably use this procedure on the Cinderella's shoe to determine its size, although it would be an extremely complicated way to do this compared to simply measuring with a ruler or tailor's tape.

Megan explains that her mother, a math professor (drawn as Hairbun with glasses) would continue to talk when she fell asleep in the midst of reading bed time stories, and then would ramble on mixing the adventures with the math from her work. The middle panel refers to the story of The Ant and the Grasshopper with the addition of what is likely a reference to the Poincaré conjecture, a (now-misnamed) theorem in mathematics.

Megan explains that even today she is not sure which versions are the real ones. Cueball cannot understand how she would not have noticed the drastic subject changes (which seems obvious to adults, but maybe not to small children).

Megan then mentions two other story changes, the first Inductive White and the  $(n-1)$  Dwarfs was better than the original. The story is a combination of Snow White and the Seven Dwarfs with the principle of induction. But The  $\lim_{x \rightarrow \infty} (x)$  Little Pigs was a little weird toward the end. That story combines the Three Little Pigs with mathematical limits. The reason it got weird toward the end was because the number of pigs tends to infinity as

the story progresses.

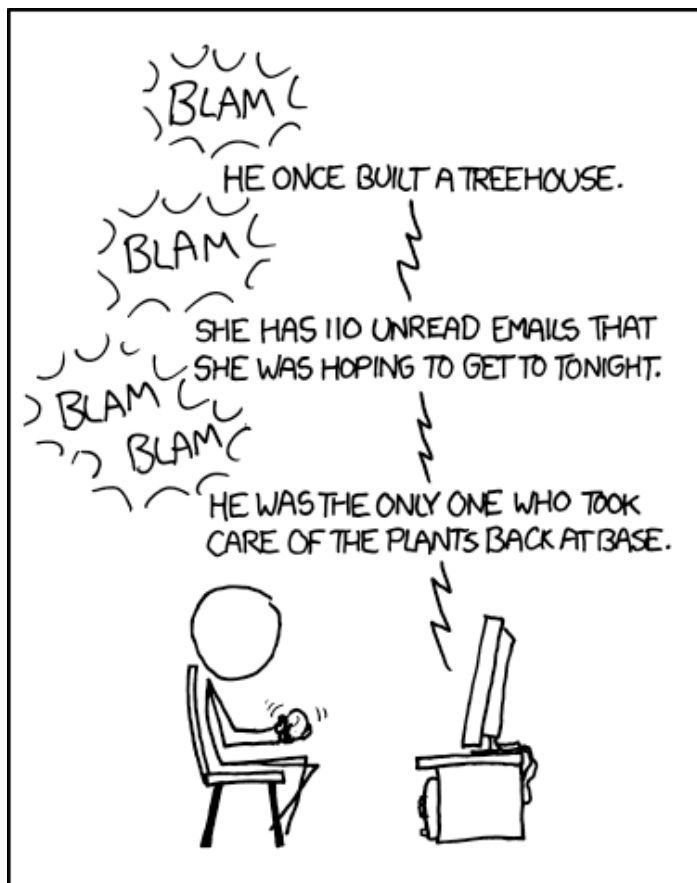
Each of the stories has a varied degree of similarity to the mathematical concepts that were mixed in as though her mom began to talk about a mathematical principle that may have been brought to mind while reading the story or already on her mind.

In the title text Megan mentions another adventure: Goldilocks' discovery of Newton's method for approximation. Newton's method for approximation is a method for finding successively better approximations to the zeroes (or roots) of a real-valued function. In Goldilocks, the protagonist finds successively better porridge and comfier chairs in a house where three bears lived. In the same way, in the Mom's version of the fairy tale, she would find successively better approximations to zeroes instead of successively better bowls of porridge, and Megan notes that it was surprising how few changes that story needed compared to the original adventure.



## #873: FPS Mod

March 16, 2011



NO ONE LIKED MY FPS MOD THAT  
GIVES YOU THREE-SECOND SNIPPETS  
FROM THE BIOS OF PEOPLE YOU SHOOT.

Wait, that second one is a woman? ... wait, if that bothers me, then why doesn't ... man, this game is no fun anymore.

## Explanation

FPS stands for First Person Shooter, which is a type of video game (like Halo or Doom) in which you are looking at the world from the first person perspective of the character you are controlling. Randall notes in the caption that no one liked his FPS mod (short for "modification" of the FPS game), and in the title text it is clear that Cueball who played this modified version no longer enjoys the game.

FPS games are controversial for their (supposed) quality of encouraging violence such as killing (especially other human beings). One point of the controversy is that, while virtual enemies are just pixels on a screen, real enemies have actual lives, emotions, and the like. In the games, there is a disconnect between the act of killing and its emotional cost, thus leading to the controversy that FPS games encourage wanton killing (or violence in general) to solve problems instead of considering the other party. Randall makes reference to this by adding a mod that gives biographical snippets of the enemy you shoot in the game, thus giving Cueball the perspective of the enemy he just shot, and causing emotional consequence and remorse by removing the disconnection between pixel and life.

The comic can also be a reference towards making games more realistic. Giving the enemies a life above being mere targets definitely makes the game more realistic, but such a game may not be that enjoyable. This has been explored

previously in 772: Frogger.

Having lots of unread e-mails was mentioned in 2389: Unread. The third comment ("take care of the plants back at base") may be referring that many FPS video games have some sort of base that you must defend or start the game in. These games do not usually feature any way to take care of plants.[citation needed]

The title text talks about how gender is portrayed in games. For some people it is more emotionally affecting to kill a woman, as women are considered biologically "weaker" than men by many societies, and societal norms state that men must protect them. Gender equality is a highly debated topic with many different viewpoints, where one's conscious reasoned views may sometimes stand at odds to subconscious feelings. When a player becomes aware that killing women bothers one more than killing men, it exposes an inconsistency in the player's own logic, one that's very uncomfortable to confront.

In the 1993 post-apocalyptic novel *The Fifth Sacred Thing*, the eco-pacifist residents of San Francisco defeat an invading army using a similar tactic. Rather than engage in armed defense, the family and friends of each dead San Franciscan speak directly to the soldiers who killed them, saying, "My wife was the mother of five children, and I loved her dearly," or "My cousin liked baseball." Eventually the soldiers suffer psychological breakdowns and defect en masse, rather as Cueball seems to do in the title text.

Amusingly, the 2014 game Watch Dogs does something quite similar to this; the in-game "Profiler" provides a brief summary of a targeted enemy, and if the enemy does not have a gameplay-relevant feature (i.e. "Can call for backup"), it will mention their hobbies or interests.

Like most other games in the Sniper Elite series, the 2017 Third Person Shooter Sniper Elite 4 allows the player to track and see brief overviews of any visible enemy by "Tagging" them with binoculars. However, Sniper Elite 4 has the distinction of also being very similar to Randall's mod in that it displays short character bios in the "Allied Intelligence" section of the overviews when Tagging in the campaign mode. They range from the mundane (year of conscription, former occupation) to the dark (Sapper Oswald Sander's brutal murder of a cowering fifteen year old makes even his fellow soldiers suspect him) to the comedic (Ewald Amsel regularly steals chocolate from his best friend Wolfram Wasser; Wolfram Wasser wonders who's stealing his supply of chocolates and has sworn to kill them).

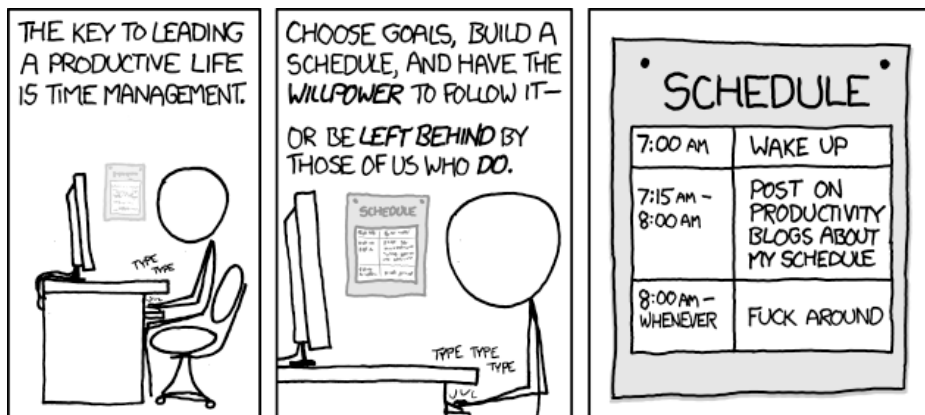
The 2012 Third Person Shooter Spec Ops: The Line also has a section where one of the antagonists will chide you with radio message when you kill one of the enemy soldiers, often with short sympathetic descriptions of the enemy you just killed (although he'll sometimes admit he didn't actually know or like that particular person). As this game is a deconstruction of the military-style shooting games of its time and their portrayal of violence, evoking a negative emotional response in the player when killing these enemies is very much intentional.

The game Borderlands 2 directly references this comic with the Morningstar, a unique aftermarket talking Hyperion sniper rifle which berates the user in a nagging, whiny voice any time they reload, kill an enemy, swap weapons, or score a critical hit. The weapon is obtained from the mission Hyperion Contract 873 (a reference to this comic being comic number 873) and is referred to as "the Hyperion ex-K seedy experimental weapon" upon completion of the mission.

Another game, Ravenfield, has a mod that makes it so that every time you kill an enemy, it gives you a small fact about the person. The Steam workshop page directly references the comic, and the author says xkcd was the inspiration for the mod.

## #874: Time Management

March 18, 2011



I never trust anyone who's more excited about success than about doing the thing they want to be successful at.

## Explanation

In the first two panels we see snippets from Cueball's posting on blogs explaining the importance of time management and its benefits. The schedule on the wall is a direct contradiction to the initial ideas and follows a very simple plan for the day, making willpower only seem necessary for getting up on time and posting on these blogs, leaving the rest of the day to do whatever he wants.

The title text explains what the schedule is about, possibly alluding that Cueball's goal in life is to be successful at messing around, not actually being successful at what would in common be considered someone would do to become successful.

It could also suggest someone who has a (shallow ego driven?) goal of "success" itself, but who may not much care about what they are achieving for itself. Thus, achieving it is would not be an intrinsic reward to them — to borrow an concept from Eliezer Yudkowsky, they are clearly ambitious, but they don't truly have an ambition. These people are probably not be the type of people Randall enjoys spending time with, since the reward for him is primarily the interesting world around him, as he has occasionally pointed out. At the same time, it could also be expressing a general skepticism of people in fields like internet marketing or inspirational coaching (who are usually also selling a product) and therefore are potentially just out to make a buck on you, especially the ones who have a free blog with a paid

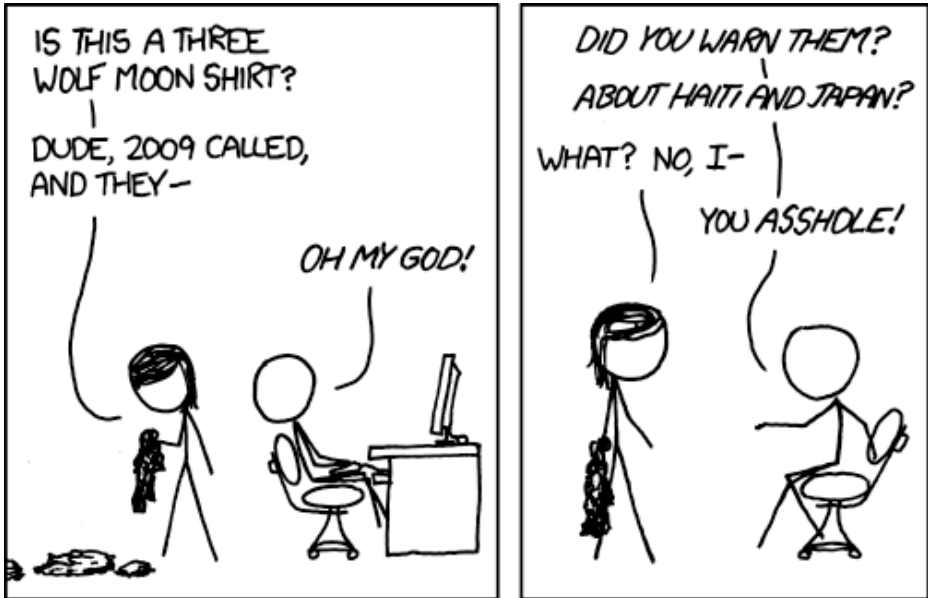
product, since it is often significantly more expensive than, say, buying a book on time management at the bookstore.

Since this comic came out (and before) there have been many comics about wasted time and general time management, see the Time management category.



## #875: 2009 Called

March 21, 2011



2017 called, but I couldn't understand what they were saying over all the screams.

## Explanation

The comic deconstructs a snowclone or common idiom - "X called, they want their Y back." In a common version, the "X" in this phrase is a year, or era, and "Y" is something that was common in that time, but is now unfashionable, or outright ridiculous.

Here, Megan notices a Three-Wolf Moon T-shirt that Cueball apparently owns. The Three-Wolf Moon is a shirt of three wolves howling at the moon that reached meme status when several people posted ironic reviews ascribing supernatural powers to it on Amazon around late 2008. Like many memes, it became popular for a short period, but rapidly became outdated.

Presumably, Megan is trying to say "2009 called, they want their shirt back", mocking Cueball for still owning something so outdated. Before she can finish, though, Cueball appears to take her literally, and responds as if she'd actually received a call from the year 2009. If she'd actually had the opportunity to communicate across time, that would be a golden opportunity to warn the people of the past about events that had not yet occurred. Specifically, he asks if she'd warned the people of the past about the February 2010 earthquake in Haiti and the March 2011 earthquake and tsunami in Japan, and admonishes her when she admits she didn't. Both of these were events in which huge amounts of human suffering and death likely could have been prevented with foreknowledge.

The comic was posted shortly after the latter disaster, so it is reasonable to assume that it was created as a specific response to what had occurred. It's not entirely clear whether Cueball is preempting Megan's attempt to mock him, or whether he actually thinks the past called.

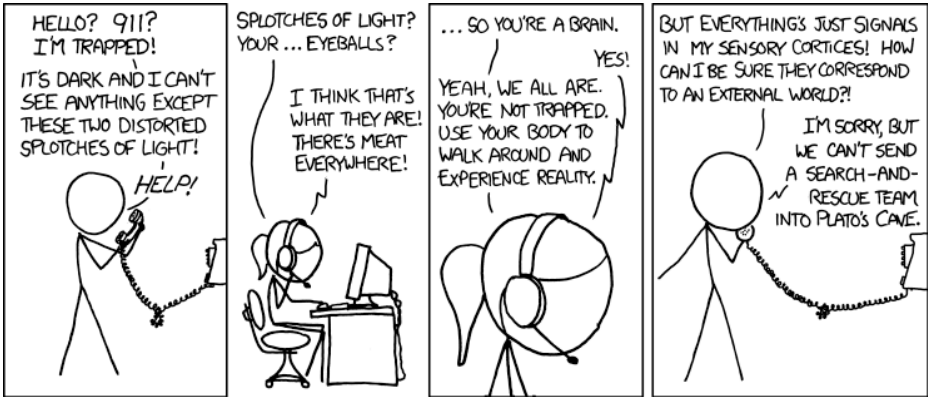
The title text continues the snowclone by implying a terrible future awaits in 2017. Likewise, non-apocalyptic events, such as political protests, can generate "yelling and screaming". Given the public's general inclination to focus on the negative the prediction of a "bad future" may have worked with any date.

2017 has occurred, and the world hasn't exploded.[citation needed] In hindsight, 2020 would work better for the joke. [insert hindsight is 2020 joke here]

However, 2017 was actually one of the world's most devastating years in terms of natural disasters, for starters, there were Hurricane Harvey, Irma, and Maria: all particularly devastating, for that particular corner of the world. In addition, the election of Donald Trump was upsetting for many people, especially people who did not agree with his controversial nature. There was no proof of Randall owning a time machine yet.

## #876: Trapped

March 23, 2011



Socrates could've saved himself a lot of trouble if he'd just brought a flashlight, tranquilizer gun, and a bunch of rescue harnesses.

## Explanation

Cueball's brain seems to be unaware it is in his body, and is freaked out by the fact that all the information it receives is through Cueball's sensory organs. The brain has no means of verifying that the information received from the senses indeed corresponds to the actual outside world; for example, all of these sensations could be hallucinations.

The 911 operator (Ponytail) references Plato's cave. This is a reference to an allegory by Plato in which he describes a scenario where prisoners are chained against a wall and can only see shadows moving on the opposite wall of the cave. These shadows would make up "reality" for the prisoners, who have no conception of a world outside the cave (or, for that matter, the objects inside the cave that are casting the shadows, which are out of view). They would create words for the things they were seeing, but that would only correspond to the shadows and not the physical things themselves casting the shadows. Plato's cave is commonly used as an analogy for the philosophical dilemma expressed by Cueball's brain in this comic. Ponytail mentions that she "can't send a search-and-rescue team into Plato's cave," referencing it as if it were an physical location.

The title text is also about Plato's cave and treats it like an actual cave with prisoners; Randall is saying that Socrates, Plato's teacher, should have just gone into the cave and brought the prisoners out instead of dealing

with the extended allegory. The tranquilizer gun is for the prisoners, so they don't completely freak out while being taken out of the cave.

## #877: Beauty

March 25, 2011



The best hugs are probably from hagfish, which can extrude microscopic filaments that convert a huge volume of water around them to slime in seconds. Instant cozy blanket!

## Explanation

Many people believe that over-analysis is boring and only serves to detract from the beauty, wonder, or emotional moments of the subject. This is especially compounded in literature classes, but it's a gripe common throughout many studies. Keats in particular is said to have joked that Newton had "destroyed all the poetry of the rainbow, by reducing it to the prismatic colors". Many experts and professionals, however, disagree greatly, claiming that they see more wonder and excitement in those subjects than they did before.

Ponytail's statement to Cueball in the first panel is proved wrong by Megan's actions throughout the comic and the statement in the title text, to the point where she retracts and changes her statement.

Megan comes in, excited about slime molds, in particular *F. septica*. Slime molds are not particularly attractive[citation needed] — in fact, the average person would probably say they were gross and slimy. Ponytail is rather grossed out and horrified by the mold, and changes her statement in response to Megan's enthusiasm for the mold, in keeping with Ponytail's own disgust. She thinks that Megan is crazy to see the wonder in such a disgusting-looking creature.

*F. septica* is a remarkable species. As the comic says, it can tolerate extremely high zinc levels. The yellow pigment bonds to the zinc and renders it biologically inactive. As

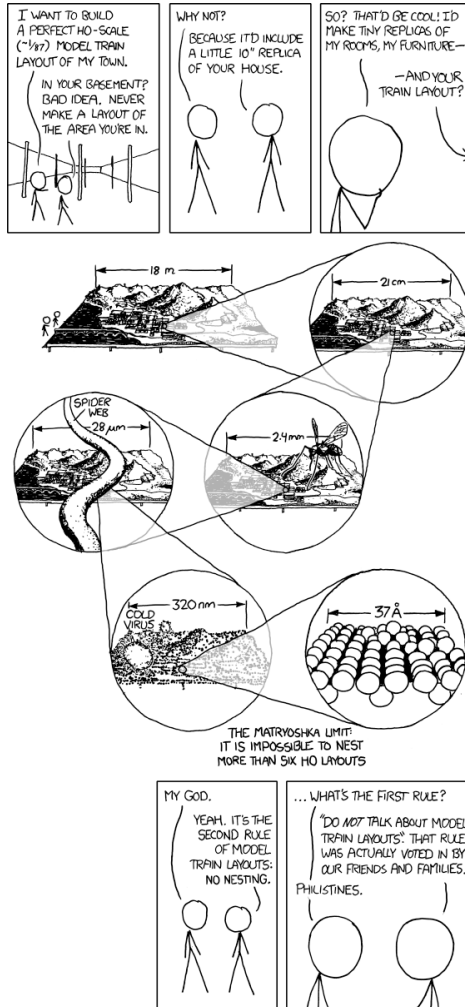


with other slime molds, it forms a multi-nucleate mass which can move like an amoeboid. It changes to a sponge-like form before releasing spores. Although the taxonomy is still fluid, the slime molds are distinct enough to be classified as neither animals, plants or fungi, but form a kingdom of their own, with some types of amoeba.

In the title text the hagfish is described as the best hugger as it can create a huge blanket of slime around it self in a few seconds, which is uses as a defense against predators, and maybe also to move out of its own "prey", which is often dead fish and whales that it burrow into to feed. "Their unusual feeding habits and slime-producing capabilities have led members of the scientific and popular media to dub the hagfish as the most 'disgusting' of all sea creatures." Nevertheless, they too fascinate researchers, and the slime may have various medical applications. See for instance the slime in this video and active slime defense (and knotting) in this video.

## #878: Model Rail

March 28, 2011



I don't know what's more telling--the number of pages in the Wikipedia talk page argument over whether the  $1/87.0857143$  scale is called "HO" or "H0", or the fact that within minutes of first hearing of it I had developed an

extremely strong opinion on the issue.

## Explanation

In model rail construction, the HO scale refers to the most popular scale for modeling railroads, in which 3.5 millimeters in the model corresponds to 1 real-world Imperial foot. As the comic suggests, it works out to a ratio of about 1:87.1 (or 3048:35 exactly, which equals 1:87.0857142). In Europe, the scale is defined as exactly 1:87 instead, to avoid references to non-metric measurements.

This comic features Cueball and his Cueball-like friend. The conversation takes place in Cueball's basement. Cueball is apparently a less-experienced train modeler, and he tells his friend that he wants to make an HO model layout of his town. However, the more-experienced friend points out that this is a bad idea, due to nesting. To make it a perfectly accurate model, Cueball would have to include a model of his house, which includes his basement, which includes the model. So, he would have to make a model of the model, which will include a smaller model of the model, and so forth. This is illustrated in the comic. Real world examples of nested models include the Bourton-on-the-Water model village, which includes 4 levels of nested models. Artwork that includes a depiction of itself is known as the Droste effect.

At the end of these six nested models The Matryoshka limit is stated: "It is impossible to nest more than six HO layouts". Matryoshka dolls are toys of Russian origin that

can be stacked inside one another. Here, the "Matryoshka limit" is the hard barrier that follows as a result of the nesting. Matter is not infinitely divisible; once one gets to the level of atoms, it is impossibly difficult to go any smaller. The unit shown in the last diagram is the ångström, a very small unit of measurement (1/10000th of a micrometre, 1/10 of a nanometre, 100 picometres or  $10^{-10}$  m) which was created when humans started discovering objects on an atomic scale, such as crystal structures or wavelengths. The last nested model looks like the atoms on a surface as seen using a scanning tunneling microscope (STM).

The rules of model train layouts reference the 1999 cult classic *Fight Club*, where the first rule of *Fight Club* is "do not talk about *Fight Club*." However, while the club instituted the rule because their activities were morally and legally questionable, the rule in the comic was instituted by friends and family members who were apparently sick of hearing the train enthusiasts talk about model train layouts all the time. The second rule of *Fight Club* is "you do not talk about *Fight Club*", repeated for emphasis, but evidently Cueball and his friend are good enough at following the first rule of model train layouts that they only had to be told once.

The "Philistines" comment is not referring to citizens of ancient Philistia (at least not directly), but rather the philosophy of Philistinism. Friedrich Nietzsche defined a Philistine as someone who is purely negative in how they define style, i.e. they know exactly what they hate and don't really have anything they like. A common

stereotype for artists is to refer to anyone who dislikes their work as "Philistines," thus dismissing their criticism as being part of a larger personality defect on the critic's part rather than any particular failing of the artwork in question.

The title text references HO scale and, more specifically, whether it should be spelled with the letter "O" or the number zero (0). Such debates often seem petty to the "layman", yet the people involved in the debates can form very strong feelings for their side. Randall recognizes "nerdy tendencies" almost immediately when he gets the urge to take a side.

## #879: Lamp

March 30, 2011



'That was definitely not in my top three wishes.' 'Who said anything about **YOUR** wishes?'

## Explanation

Cueball finds a lamp. It has a shape which suggests it is a magic lamp, which might contain a genie. Traditionally, genies grant three wishes to whoever rubs their lamp, thus freeing them. Cueball rubs the lamp, but instead of releasing a genie, the lamp appears to ejaculate. Cueball is grossed out by this and holds the lamp away from him.

The imagery and style of the comic are intentionally similar to male stimulation and ejaculation. The act of rubbing one's genitals to stimulate orgasm is well known and well documented in both literature and science.[citation needed] However, almost anyone would be disturbed by unintentionally giving sexual pleasure to a stranger.

In the title text, a discussion is shown between Cueball and the lamp. Cueball states that what happened was NOT one of the three wishes he would have asked for if a genie had been released, and the lamp retorts, "Who said anything about YOUR wishes?", implying that the lamp's wish was to receive "handy" stimulation (or possibly that the last user of the lamp wished for that to happen to the next owner).

Genies are also mentioned in at least five other comics:

- 152: Hamster Ball
- 532: Piano (where the joke is also penis related)
- 1391: Darkness



- 2193: Well-Ordering Principle
- 2741: Wish Interpretation

In the song *Genie in a Bottle*, from 1999 by Christina Aguilera, the sexual comparison of rubbing a genie in bottle is very clear in the song, although here it is a woman genie that needs to be rubbed in the right way to be let out.

## #880: Headache

*April 01, 2011*



WHEN YOU THINK ABOUT IT, THIS EXCUSE  
CAN GET YOU OUT OF ALMOST ANYTHING.

I'm only willing to visit placid lakes, salt flats, and painting exhibits until the world's 3D technology improves.

## Explanation

This was the second April fools' comic released by Randall, but in principle the first real one to be released on April 1st, which in 2011 fell on a Friday, a normal release day for xkcd. The joke made every comic up to and including this one 3D (sans 848: 3D, as "the third dimension is tightly rolled up and too small to observe at normal energies"), thus forcing people like Cueball to endure 3D even at their computer screens. The 3D view is still available at [3d.xkcd.com](http://3d.xkcd.com) for all comics prior to this one.

The previous fools comic was literally Not Found. After this comic Randall began releasing April Fools comic every year on April 1st disregarding the weekday of that date. The next was 1037: Umwelt released on Sunday April 1st 2012, the first to use another day of the week than Monday, Wednesday, or Friday. Some people suffer from headaches, eyestrain, motion sickness and other problems when watching 3D movies, playing 3D games, watching 3D television, playing hand-held Nintendo 3DS, etc.

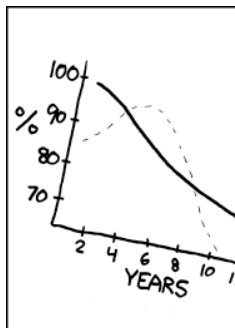
In this comic, Cueball is using the excuse that 3D gives him a headache to get out of going outside into the real world, where everything is in 3D. Instead he stays inside and looks at his 2D computer monitor. In the title text, he says he will only go to flat places (i.e. places where everything he could see would be 2D-like). In his Øredev 2013 talk Randall mentions that a few of his friends

created this 3D view and told him just 1.5 hours before the scheduled comic for that day would go live. Randall quickly drew a 3D themed comic to match.

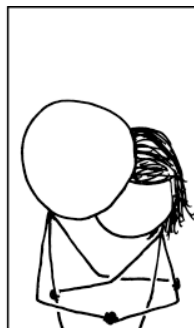
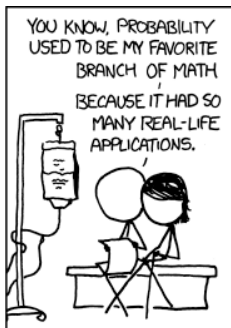
The title text suggests that Cueball is only comfortable seeing objects with visible flat surfaces like flat movie and TV screens (which the entertainment industry would not call "3D").

## #881: Probability

*April 04, 2011*



5 YEARS	81%
10 YEARS	77%



My normal approach is useless here, too.

## Explanation

Cueball and Megan are sitting on a hospital bed, reading a piece of paper with the statistics for breast cancer survival. It looks like Megan has just been diagnosed with breast cancer. The thick line represents the survival rate distribution (probability to be alive after  $X$  years, unconditioned): 81% are alive at 5 years, while 77% survive to 10 years. The dashed line represents the hazard function (the negative derivative of the thick line divided by the value of the thick line at each point, i.e. how fast the thick line falls with respect to the current value, or the risk of failing/dying at time  $t+\Delta t$  after having survived until time  $t$  as  $\Delta t$  approaches zero), which is the rate between the density of the failure distribution and the survival function. Cueball expresses how he used to find probability enjoyable because of its applicability to the real world, but now sees things differently facing a painful situation involving it.

Randall wrote this comic after his fiancée was diagnosed with breast cancer. Two months after posting this strip, he posted this blog post explaining the cancer comics.

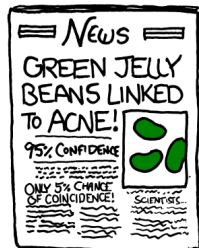
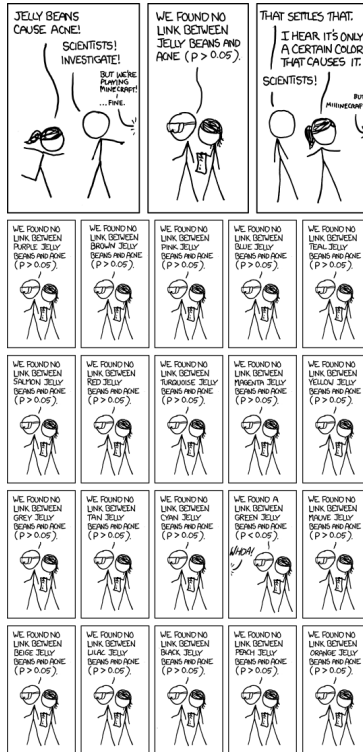
The title text is a reference to 55: Useless, where his normal approach also fails him regarding love. Cueball's (and Randall's) normal approach — math — isn't much help in dealing with these types of emotional situations.

A number of further comics have addressed this scenario, in particular the retrospective and occasional series of

comics 1141: Two Years, 1928: Seven Years and 2386:  
Ten Years.

# #882: Significant

April 06, 2011



'So, uh, we did the green study again and got no link. It was probably a--' **'RESEARCH CONFLICTED ON GREEN JELLY BEAN/ACNE LINK; MORE STUDY RECOMMENDED!'**



## Explanation

This comic is about data dredging (aka p-hacking), and the misrepresentation of science and statistics in the media. A girl with a black ponytail comes to Cueball with her claim that jelly beans cause acne, and Cueball then commissions two scientists (a man with goggles and Megan) to do some research on the link between jelly beans and acne. They find no link, but in the end the real result of this research is bad news reporting!

First, some basic statistical theory. Let's imagine you are trying to find out if jelly beans cause acne. To do this you could find a group of people and randomly split them into two groups - one group who you get to eat lots of jelly beans and a second group who are banned from eating jelly beans. After some time you compare whether the group that eat jelly beans have more acne than those who do not. If more people in the group that eat jelly beans have acne, then you might think that jelly beans cause acne. However, there is a problem.

Some people will suffer from acne whether they eat jelly beans or not, and some will never have acne even if they do eat jelly beans. There is an element of chance in how many people prone to acne are in each group. What if, purely by chance, all the group we selected to eat jelly beans would have had acne anyway while those who didn't eat jelly beans were the lucky sort of people who never get spots? Then, even if jelly beans did not cause acne, we would conclude that jelly beans did cause acne.

Of course, it is very unlikely that all the acne prone people end up in one group by chance, especially if we have enough people in each group. However, to give more confidence in the result of this type of experiment, scientists use statistics to see how likely it is that the result they find is purely by chance. This is known as statistical hypothesis testing. Before we start the experiment, we choose a threshold known as the significance level. In the comic the scientists choose a threshold of 5%. If they find that more of the people who ate jelly beans had acne and the chance it was a purely random result is less than 1 in 20, they will say that jelly beans do cause acne. If, however, the chance that their result was purely by random chance is greater than 5%, they will say they have found no evidence of a link. The important point is this – there could still be a 1 in 20 chance that this result was purely a statistical fluke.

At first, the scientists do not want to stop playing Minecraft, but they do eventually start. Minecraft was previously referenced in 861: Wisdom Teeth.

The scientists find no link between jelly beans and acne (the probability that the result is by chance is more than 5% i.e.  $p > 0.05$ ), but then Megan and Cueball ask them to see if only one color of jelly beans is responsible. They test 20 different colors, each at a significance level of 5%.

This finding leads to a big newspaper headline saying Green Jelly Beans Linked To Acne where it is said that they have 95 percent confidence with only a 5% chance of a coincidence. Unfortunately, while the p-values

reported by the scientists are (presumably) mathematically correct, the wording in the newspaper is misleading and would only apply if green jelly beans were the only ones tested. Common sense should tell you that when you do a whole bunch of tests, it becomes much more likely that you'll get a false positive result.

In the title text, we find out that the scientists repeated the experiment (another key part of the scientific method), but now they no longer find any evidence for the link between acne and green jelly beans. They try to tell the reporter something, maybe that it was probably a coincidence, but the reporters are not interested since that is not news, and refuse to listen. Instead, they make another major headline from the repeat study saying Research conflicted (which is not accurate, the scientists doubted their results and had their doubts confirmed) and recommend more study on the link (which is what the scientist just did).

To elaborate on the statistical theory behind this issue:

If the probability that each trial gives a false positive result is 1 in 20, then by testing 20 different colors it is now likely that at least one jelly bean test will give a false positive. To be precise, the probability of having zero false positives in 20 tests is  $0.9520 = 35.85\%$  while the probability of having at least 1 false positive in 20 tests is  $64.15\%$  (the probability of having zero false positive in 21 tests (counting the test without color discrimination) is  $0.9521 = 34.06\%$ ).

In scientific fields that perform many simultaneous tests

on large amounts of data it is therefore common to adjust for the effect of multiple testing; typically by controlling the False Discovery Rate which is the number of (expected) false positives compared to all positive results (here, it would be  $1/1=1$ ). For this, you bundle your tests into a single "test of tests" and adjust your single-test p-values such that the chance of your "test of tests" reporting a significant result falls below a certain threshold. Typically, that threshold is 0.05 - the same as the conventional p-value for a single test, and it can be interpreted the same way: that only 1 in 20 "tests of tests" would report a result at this level of significance even if the null hypothesis were true.

Applying the Benjamini–Hochberg procedure, the lowest p-value of a set of 20 tests would need to be smaller than  $(1/20)*0.05 = 0.0025$  to be accepted as significant. Such an adjustment would likely have prevented the situation depicted in the comic.

This general situation is (sadly) often an issue with more serious matters than jelly beans and acne – at any one time there are many studies about possible links between substances (e.g. red wine) and illness (e.g. cancer). Because only the positive results get reported, this limits the value any single study has - especially if the mechanism linking the two things is not known.

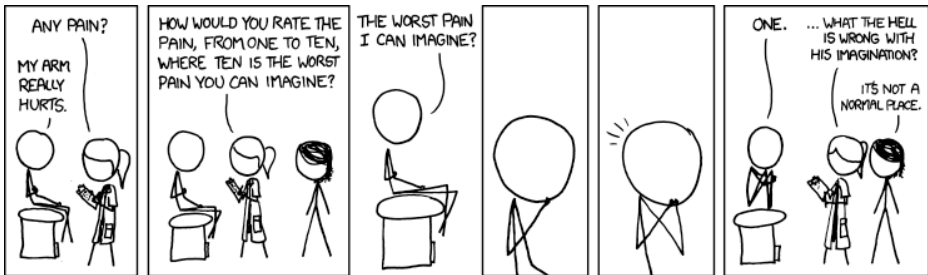
### **p-hacking and bad news reporting in real life[edit]**

In 2015 some journalists demonstrated the same problem: just how gullible other news outlets are with the same sort of flawed "experimental design": How, and why, a journalist tricked news

outlets into thinking chocolate makes you thin - The Washington Post

## #883: Pain Rating

*April 08, 2011*



If it were a two or above I wouldn't be able to answer because it would mean a pause in the screaming.

## Explanation

In medical examinations, a doctor will sometimes ask the patient to assess their pain, to give the doctor a rough idea of the patient's condition. Cueball is asked by doctor Ponytail to compare the pain in his arm with the worst pain that he can imagine; however, a one-to-ten scale is not useful for Cueball because in his imagination the worst possible pain reduces him to a huddled ball, makes him forget his injured arm, and rescales his current pain to a 1. Apparently, he has the capacity to imagine pain so intense that it dwarfs any possible real-world pain, thus skewing the scale, and this is what his friend Megan refers to when Ponytail asks what is wrong with his imagination. (According to the official transcript Megan is the patient's friend, and Ponytail is a doctor). A similar doctor Ponytail is shown in 996: Making Things Difficult with Megan and again in 1713: 50 ccs along with both Cueball and Megan. In 647: Scary Cueball (as Rob) also ends up in such a huddled up position.

The title text further emphasizes that idea: If the pain was higher than one on his pain scale, it would already be so high that he would be reduced to uncontrollable, unending screaming.

## #884: Rogers St.

*April 11, 2011*



BEFORE I HAVE A KID, I'M  
MOVING TO ROGERS STREET IN  
CAMBRIDGE, MA, AND THEN  
GETTING A CAT NAMED "MISTER"

JUST TO GUARANTEE THE KID  
WILL NEVER GO INTO PORN.

'We can also use middle names in place of first pet's names, but yours is something incomprehensible about dropping tables.'



## Explanation

This comic is a reference to the game of creating your "porn star name" by putting your pet's name as your first name and the street you grew up on as your last name. For example: Max (Dog's name) Pine (Street name). In this comic, Randall would have named his cat "Mister" and had moved to "Rogers" Street and so his kid's porn name would be "Mister Rogers" (from the children's show *Mister Rogers' Neighborhood*, and previously the topic of 767: *Temper*), which is pretty high on the unsexy name scale (if there was one) especially for a porn actor, although it may attract people with weird sexual fetishes. In this way, Randall has prevented his kid from getting into porn.

In the title text, he references the other way of creating a porn star name by using your middle name as your first name and the street still as your last name. Additionally, the title text references comic 327: *Exploits of a Mom* in which Mrs. Roberts puts SQL instructions into her son's name so that it will mess with the database at school. In the comic, the kid's name is Robert'); DROP TABLE Students;-- and we are led to believe the person in the comic above may be the same person. His middle name supposedly would be DROP TABLE Students, which is indeed something incomprehensible about dropping tables. (In SQL, commands are separated by semicolons ;, and strings of text are often delimited using single quotes '. Parts of commands may also be enclosed in parentheses ( and ). Data entries are stored as "rows" within named

"tables" of similar items (e.g., Students). The command to delete an entire table (and thus every row of data in that table) is `DROP TABLE`, as in `DROP TABLE Students;`).

If this is indeed Little Bobby Tables shown trying to get into porn using his pet and street name, then he has grown considerably since his last appearance from the above-mentioned comic where he talks to his mother Mrs. Roberts, the famous hacker, who gave him the name with the code. Given his developing curly hair and looks that have taken him to the porn industry, it was clever of her to move to Roger St... But that seems her way, being clever with names.

Here's a link to the location of Rogers Street, which is near Kendall Square in Cambridge, Massachusetts.

## #885: Recycling

*April 13, 2011*



I WORRY A LOT ABOUT WHAT  
THE PEOPLE AT THE RECYCLING  
CENTER THINK OF ME.

And given how much of my stuff they go through, they definitely know where I live.

## Explanation

Recycling plants often can only process one type of material at a time, which necessitates some form of sorting facility. Randall shows some degree of thoughtfulness in separating his paper from metals for the convenience of the people working at the facility, but then he leaves congealed juice in a bottle, rendering it unrecyclable without cleaning and extra effort on the part of the recycling facility.

Obviously, this would be very annoying, causing the Cueball in the comic (who works in one such facility) to call him an asshole.

The title text implies that the workers know his address, most likely from various envelopes and junk mail that he has recycled.

It is likely in reality that the workers must process quantities of material too large to quickly to be able to pick up on these details and to analyse them to the point of reading addresses. However, such details might be gleamed by automated scanners if they were installed for such purposes.

As always, Randall is both a self-conscious man and a paranoid man.

## #886: Craigslist Apartments

April 15, 2011

ALL APARTMENTS

SEARCH FOR:  IN: ☒ ALL APARTMENTS ☐ TITLE ONLY ☒ ENTIRE POST

RENT:   ☒ 0+ BR ☐ CATS ☐ DOGS ☐ HAS IMAGE

FRI APR 15

\$1600 / 2BR ~~~ HARDWOOD FLOORS, UTILITIES INCLUDED. CATS OK, LIMIT ONE PER SQUARE FOOT.

\$1100 / \*\*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*\*

\$2300 / 3BR !!!!!!! ELEGANT APARTMENT PERMANENTLY LIT BY STROBE LIGHT!!!! NO FLOOR.

\$1100 / \*\*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*\*

\$980 / 1BR NEW "HAMMOCK"-STYLE DWELLING. WATER AND HEAT FREE FROM SAME DISPENSER. VIKING LANDLORD.

\$1550 / 2BR (ONE INSIDE THE OTHER). HAS RUNNING WATER, IN A SENSE. FREE HEAT IN SHORT, INTENSE BURSTS. KLEIN STAIRS.

\$1100 / \*\*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*\*

\$1100 / \*\*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*\*

\$3200 / 1BR W/TRIMMED CARPET AND PERT FIXTURES. PREVIOUS TENANTS CLEAN. CALL NOW, WANT YOU INSIDE. \$120/NIGHT (NO ANIMALS)

\$2100 / 3BR ON SCENIC ASH TREE LANE. BUILDER UNKNOWN; HOUSE HAS ALWAYS EXISTED. WALLS SHIFT; CENTER OF HOUSE MAY CONTAIN MINOTAUR.

\$1100 / \*\*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*\*

\$600 / 5BR THREE FLOORS W/POOL, ROOFTOP GARDEN, BEAUTIFUL GLASS FACADE, NO CATCH. 5-MIN DRIVE TO HISTORIC PRIPYAT.

\$7100 / 60BR SLEEK MODERN W/EXTREME RUNNING WATER. PREVIOUS TENANTS MAY RESIST ENTRY. CONTAINS ALL NEW WIRING AND IS A SUBMARINE.

\$1616 / 3BR + 2 BATH, TUB FULL OF BLOOD. CLOSET FULL OF BOARD GAMES WHICH PLAY THEMSELVES. PETS OK BUT WON'T SURVIVE LONG.

**\$1600 / 1386153BR 3BATH, MODERN SLIDING DOORS, GUEST ROOMS, GARBAGE DISPOSAL. FREE MANDATORY PARKING (ENFORCED). CONVENIENT TO ALDERAAN.**

## Explanation

This is a comic about the potential pitfalls in finding an apartment on Craigslist. Just as in Craigslist, some of the posts are re-posted several times. Additionally, lots of posts use lots of tildes, exclamation points or asterisks as above to set their posts apart from others.

BR means bedroom, e.g. 3BR means that apartment has 3 bedrooms (common measurement of apartment size).

- \$1600 / 2BR ~~~ Hardwood floors, utilities included. Cats OK, limit one per square foot.
- \$1100 / \*\*\*\* GREAT DEAL SQUARE HOUSE DOOR IN FRONT!!! \*\*\*\*
- \$2300 / 3BR !!!!!!! Elegant apartment permanently lit by strobe light!!!! No floor.
- \$980 / 1BR New "hammock"-style dwelling. Water and heat free from same dispenser. Viking landlord.
- \$1550 / 2BR (one inside the other). Has running water, in a sense. Free heat in short, intense bursts. Klein stairs.
- \$3200 / 1BR W/trimmed carpet and pert fixtures. Previous tenants clean. Call now, want you inside. \$120/night (no animals)
- \$2100 / 3BR on scenic Ash Tree Lane. Builder unknown; house has always existed. Walls shift; center of house may contain minotaur.
- \$600 / 5BR Three floors w/pool, rooftop garden,

beautiful glass facade, no catch, 5-min drive to historic Pripyat.

- \$7100 / 60BR Sleek modern w/extreme running water. Previous tenants may resist entry. Contains all new wiring and is a submarine.
- \$1616 / 3BR + 2Bath, tub full of blood. Closet full of board games which play themselves. Pets OK but won't survive long.
- \$1600 / 1386153BR 3bath, modern sliding doors, guest rooms, garbage disposal. Free mandatory parking (enforced). Convenient to Alderaan.

## #887: Future Timeline

*April 18, 2011*



Year	Event	Source
2011	...	...
2012	...	...
2013	...	...
2014	...	...
2015	...	...
2016	...	...
2017	...	...
2018	...	...
2019	...	...
2020	...	...
2021	...	...
2022	...	...
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2098	...	...
2099	...	...

Not shown: the approximately 30,000 identical, vaguely hysterical articles titled "WHITE PEOPLE IN [THE US/BRITAIN] TO BECOME MINORITY BY [YEAR]!", which came up for basically any year I put in.



## Explanation

This comic uses the same strategy as comic 715: Numbers, in which Randall uses Google to search for phrases and then charts the results. This one is charted as a timeline, whereas 715 was charted as line graphs.

It is a list of things predicted or announced by anyone at any time (the ones you see on Google search using "by the year..." or similar statements).

"2101 - War Was Beginning" is a reference to the opening narration of video game Zero Wing; the same narration is famous for the internet meme "All your base are belong to us". As there are not any other out and out references in the comic, and the rest are actually results that you can find using Randall's methods, "War Was Beginning" was probably the only thing he got when he googled 2101 as well.

Certain events in this comic, e.g., "Social Security stops running surplus", are repeated multiple times. Also, certain bizarre events, like "Apocalypse occurs", or "Flying cars reach market", happen before rather plausible things, like "'Big one' hits California". Certain events, like "Japan is a robot-only country" or "Gillette introduces 14-blade razor" may be related to the recurring theme 605: Extrapolating.

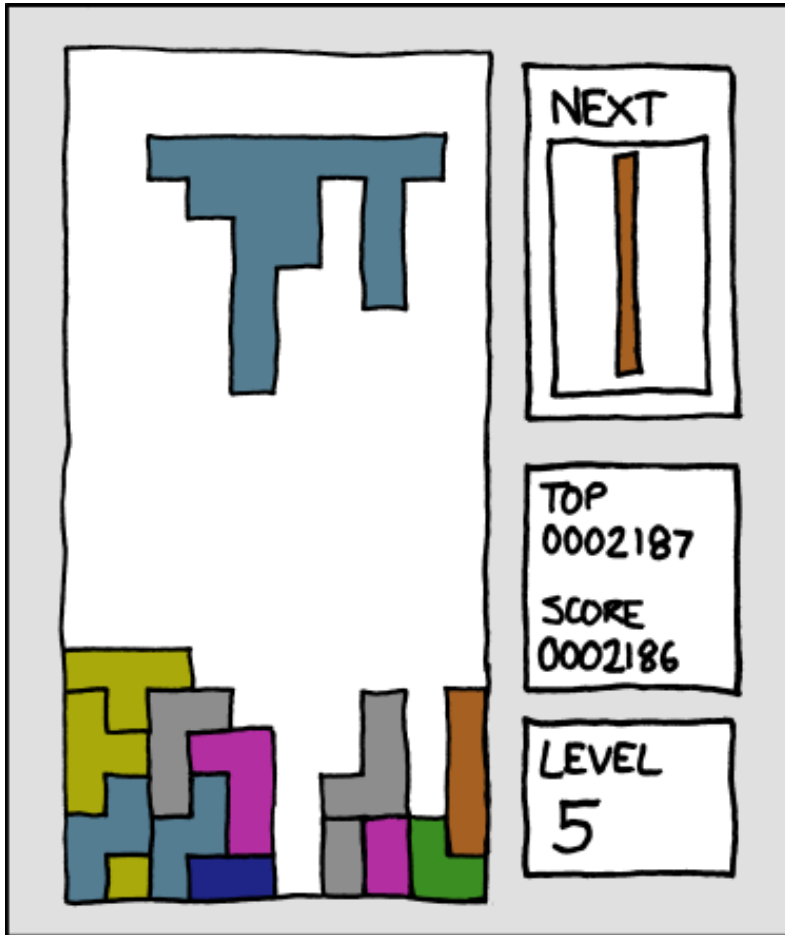
According to some official projections, (non Hispanic) White people will no longer be the majority in the United States by 2045 due to low birth rates and high

rates of immigration. The title text is Randall's statement that, for both the US and Great Britain, there are so many sources that mention this, for any year he cared to search for and many using more far more doubtful sources (if any), that he decided that it was not worth flooding the chart with all these spurious repetitions, even though he did include other less prolific recurring themes.

This comic has similar features to 1413: Suddenly Popular, 1093: Forget, and 891: Movie Ages.

## #888: Heaven

*April 20, 2011*



# HEAVEN

If you've never had sex, this is what it feels like. Complete with the brief feeling of satisfaction, followed by ennui, followed by getting bored and trying to make it happen again.

## Explanation

This comic shows the popular video game Tetris, in which you use different shaped pieces to fill in lines to score points. Filling multiple lines by adding a single piece results in bonus points. Normally all pieces — typically referred to as "Tetrominos" — are made up of four small squares. This has also been the case for all the pieces at the bottom of the game; however, some parts of some blocks have been erased, likely when a line had been deleted because it was full.

Heaven, in Tetris, is when you get the perfect piece that fills out all the other pieces on the board. The falling piece here is really odd, but it fits the 18 bare spaces exactly to make it possible to remove 6 lines in a row, compared to the four that is normally possible using the "I" tetromino (represented in Tetris as a straight line of four blocks, and in this comic as a straight brown bar). On top of the heavenly feeling of getting a piece that fits, the top score is also about to be smashed, as the player was at the moment only one point until reaching it!

The next piece, shown to the right, which shall come after the special one, is much taller than the normally possible "I" tetromino. A normal one can be seen at the bottom right of the game. This next piece seems to be ten tall, which when rotated fits the cleared bottom of the well perfectly.

The title text compares this experience with sex,

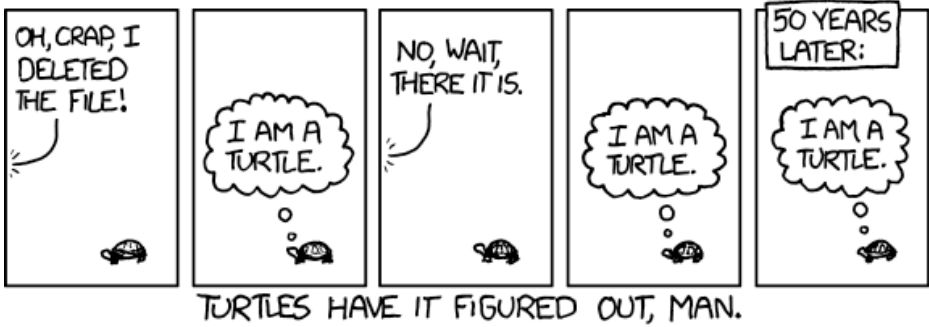
complete with an orgasm and the feelings you get right after sex. After "the brief feeling of satisfaction" from the orgasm you are bored, ennui means a feeling of utter weariness and discontent resulting from satiety or lack of interest, but at the end you want more.

Also see comic 724: Hell, which presents an opposing situation in which the game is designed to be impossible to play.

Choosing to post a comic called Heaven as number 888 is not a coincidence—as in Christian numerology, the number 888 represents Jesus and in Chinese numerology it represents triple fortune.

## #889: Turtles

*April 22, 2011*



You're a turtle!

## Explanation

This comic is about the frivolousness of many modern problems. While an offscreen character is panicking over deleting a file, the turtle is content with just being a turtle. The text saying "turtles have it figured out, man" indicates that Randall appreciates this simpler mode of thought.

Based on its appearance, it is possible that the turtle is a tortoise (biologists call all testudines turtles, and tortoises are the family of land-based turtles), which is also supported by the fact that tortoises tend to have much longer lifespans (100 to 150 years) than sea turtles and terrapins (approximately 80 years).

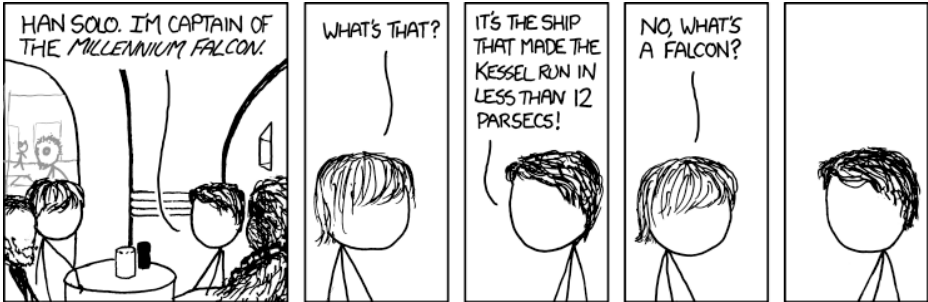
An alternative explanation could be that the satisfaction of knowledge that the creature has poses an obstruction to his venturing out and finding its true identity. It was told that it's a turtle, thus, it continues to believe, even though it's wrong. The minor panicking of humans actually is a driving force of our sentience.

The title text is possibly a reference to 231: Cat Proximity. It also resembles Towelie's Catchphrase from South Park.

The text at the bottom "Turtles have it figured out, man" could be a reference to the turtle in Finding Nemo, who speaks in a similar manner.

## #890: Etymology

*April 25, 2011*



For some reason, my childhood suspension of disbelief had no problem with the fact that this ancient galaxy is full of humans, but was derailed by language. There's no Asia OR Europe there, so where'd they get all the Indo-European roots?



## Explanation

This comic references one of the scenes from the sci-fi classic Star Wars set in Mos Eisley Cantina at the spaceport on Tatooine, a wretched hive of scum and villainy.

In this scene Obi-Wan Kenobi (with the beard) and Luke Skywalker on the left are trying to get off the planet secretly and they enlist help from Han Solo and Chewbacca.

Han Solo tells Luke he is captain of the famous ship the Millennium Falcon. When Luke asks what that is, Han brags "It's the ship that made the Kessel Run in less than 12 parsecs!" But it turns out that what Luke asks about is what a falcon is.

Etymology is the study of the history of words, their origins, and how their form and meaning have changed over time. Randall wonders what Luke would say to Han if he had no idea what a falcon was.

Normally in sci-fi aliens would have some familiarity with Earth and the things you can find on it, such as falcons. However, Star Wars takes place "a long time ago in a galaxy far, far away" where nobody knows Earth even exists, possibly before falcons exist, thus how could the Millennium Falcon be named after an animal they have no knowledge about? This could be an example of a translation convention made for the sake of the audience;

presumably, fast birds of prey exist in the Star Wars universe, one of which is the namesake of Han Solo's ship, which is then artistically translated from Basic to English as "Falcon". Likewise with the parsec, which is a unit defined by the distance of a star from the Earth which experiences a parallax of one arcsecond when viewed six months apart (i.e. it is the length of a triangle with a base of 1 AU and the opposite angle of 1 arcsec). A galaxy which is home to space-faring civilizations will have units of similar magnitudes, which are converted into parsecs for our convenience.

In the Star Wars novelization, this joke is made in reference to a duck:

Having grown up on a desert world, Luke would have no idea of what a duck or any other kind of waterfowl is, while Obi-Wan Kenobi could have seen such creatures during his time as a Jedi (Captain Panaka uses the "sitting ducks" metaphor in *The Phantom Menace*, so they are known to exist in Star Wars canon). Perhaps Luke would have understood if Obi-Wan had used a desert creature in an equivalent analogy.

In the title text, Randall muses over the fact that he as a child did not have any problems dispensing his disbelief in a distant galaxy full of humans, but was still derailed by the language. It would seem unlikely that another galaxy has creatures so similar to humans, while at the same time being filled with so many other types of creatures.

The bit about Indo-European roots is another reference to etymology. English is a language descended from a language called Proto-Indo-European, or PIE (along with most languages in Europe, West and South Asia), thus many words in these languages can ultimately be traced back to PIE. Randall wonders how the vocabulary in Star Wars can also be traced back to PIE despite the lack of Europe or Asia in that universe.

# #891: Movie Ages

April 27, 2011

## THE 2011 GUIDE TO MAKING PEOPLE FEEL OLD — USING MOVIE RELEASE DATES —

THEIR AGE	YOU SAY...			
16	"DID YOU REALIZE THAT..."	SNAKES ON A PLANE	CAME OUT	HALF A DECADE AGO?"
17		REVENGE OF THE SITH		MORE THAN HALF A DECADE AGO?"
18				EIGHT YEARS AGO?"
19				
20		FINDING NEMO		TEN YEARS AGO?"
21		SHREK		NOT LAST DECADE, BUT THE ONE BEFORE THAT?"
22				
23		THE MATRIX		OVER FIFTEEN YEARS AGO?"
24				
25				TOY STORY
26		THE LION KING		EIGHTEEN YEARS AGO?"
27		JURASSIC PARK		TWENTY YEARS AGO?"
28		TERMINATOR 2		MORE THAN TWENTY YEARS AGO?"
29				
30		HOME ALONE		CLOSER TO THE MOON LANDING THAN THE PRESENT DAY?"
31				
32				
33	THE LITTLE MERMAID			
34				
35				
OVER 35	"HEY, DID YOU SEE THIS CHART? YOU MATCH YOUR AGE TO MOVIE— OH, RIGHT, SORRY, IT ONLY GOES UP TO 35. I GUESS IT'S NOT REALLY AIMED AT OLDER PEOPLE."			

If you're 15 or younger, then just remember that it's nevertheless probably too late to be a child prodigy.

## Explanation

Based on the person you are talking to, take their age on the far left, add "Did you realize that..." add the corresponding movie that is across from their age then "...came out..." add the phrase at the end of row.

E.g. - If a person is 30, then it would go a little something like this "Did you realize that Home Alone came out more than 20 years ago?"

This would make people feel old because certain movies that they felt were close to them are actually aging quickly. In a way, this chart likens the age of the movie to the age of the person, as the person in each case was about 9-12 years old when the movie came out, but as movies have shorter "life cycles" and seem to lose glory quickly, it seems that the movie is very old. However, the age at which a movie is accepted to be old is not nearly as large as the age at which a person is accepted to be old, so the person is not actually that old. This makes it seem that the person is far older than they actually are.

And since this chart is designed to make someone feel old, anyone over 35 gets lumped in with "older people," which no one likes.

The title text states that if you are 15 or younger it is probably already too late to be a child prodigy. This may be a reference to 447: Too Old For This Shit, in which Randall believes that anyone over the age of 11 has

already missed out on their chance to become famous.

Randall has covered making people feel old several times in 647: Scary, 973: MTV Generation, 1393: Timeghost and 1477: Star Wars.

## #892: Null Hypothesis

*April 29, 2011*



Hell, my eighth grade science class managed to conclusively reject it just based on a classroom experiment. It's pretty sad to hear about million-dollar research teams who can't even manage that.

## Explanation

This comic (and the title text) is based on a misunderstanding. The null hypothesis is the hypothesis in a statistical analysis that indicates that the effect investigated by the analysis does not occur, i.e. 'null' as in zero effect. For example, the null hypothesis for a study about cell phones and cancer risk might be "Cell phones have no effect on cancer risk." The alternative hypothesis, by contrast, is the one under investigation - in this case, probably "Cell phones affect the risk of cancer."

After conducting a study, we can then make a judgment based on our data. There are statistical models for measuring the probability that a certain result occurred by random chance, even though in reality there is no correlation. If this probability is low enough (usually meaning it's below a certain threshold we set when we design the experiment, such as 5% or 1%), we reject the null hypothesis, in this case saying that cell phones do increase cancer risk. Otherwise, we fail to reject the null hypothesis, as we have insufficient evidence to conclusively state that cell phones increase cancer risk. This is how almost all scientific experiments, from high school biology classes to CERN, draw their conclusions.

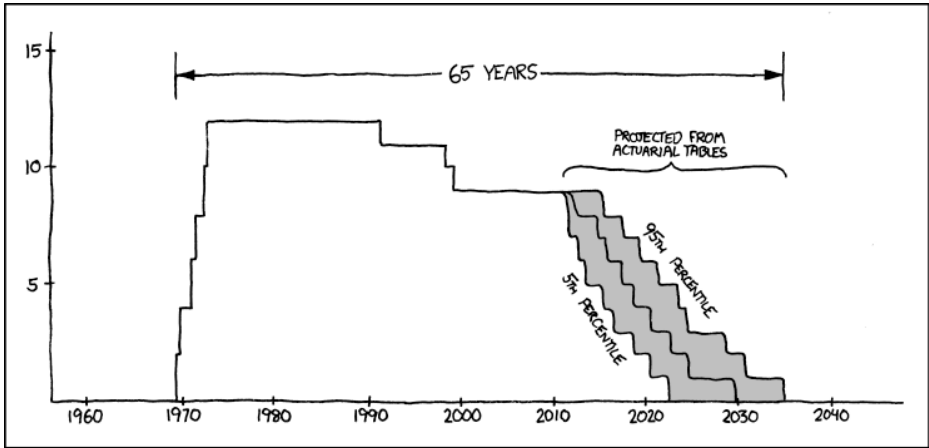
The null hypothesis is thus a specific statement relative to the current study. In the comic, Cueball apparently misunderstands this. Recalling a study that disproved the null hypothesis relative to that study, Cueball believes that "the null hypothesis" has been disproven, and



wonders why the concept is still taught in school, especially given that, as the title text says, his eighth grade class "conclusively rejected it just using a classroom experiment".

## #893: 65 Years

May 02, 2011



NUMBER OF LIVING HUMANS WHO HAVE WALKED ON ANOTHER WORLD

The universe is probably littered with the one-planet graves of cultures which made the sensible economic decision that there's no good reason to go into space--each discovered, studied, and remembered by the ones who made the irrational decision.

## Explanation

Randall is showing the number of still living humans who have walked on another world for the 65-year period that begins in 1969 (when a human first walked on the Moon). Up to 2011 (when the comic was drawn), he has drawn a single line for the actual figures.

For the subsequent years, he has drawn three lines using actuarial tables or life tables (such tables show, for each age, the probability that a certain person will die within the next year).

The line marked "5th Percentile" indicates that there is a 95% probability that the number alive in a given year will be above that line and a 5% probability that the number alive will be below that line. For example, this line indicates a 5% chance that all Apollo moon-walkers will be dead by 2023, and a 95% chance that at least one will still be alive by that year.

The line marked "95th Percentile" indicates that there is a 5% probability that the number alive in a given year will be above that line and a 95% probability that the number alive will be below that line. For example, this line indicates a 95% chance that all Apollo moon-walkers will be dead by 2035, and a 5% chance that at least one will still be alive by that year.

The middle line is not identified, but is probably the "50th Percentile" (see these tables). If so, it indicates that

there is a 50% probability that the number alive in a given year will be above that line and a 50% probability that the number alive will be below that line. For example, this line indicates a 50% chance that all Apollo moon-walkers will be dead by 2028 (see previous link), and a 50% chance that at least one will still be alive by that year.

Although the term other world would include all other worlds on which humans have walked, there is currently only one other world on which humans have walked, which is the Moon. The humans that have walked there are the 12 Apollo astronauts who landed on the Moon between 1969 and 1972.

In particular, Neil Armstrong and Buzz Aldrin landed in July 1969. Pete Conrad and Alan Bean landed in November. Alan Shepard and Edgar Mitchell: February 1971. David Scott and James Irwin: July 1971. John Young and Charles Duke: April 1972. Eugene Cernan and Harrison Schmitt: December 1972.

Irwin died in 1991. Shepard and Conrad died in 1998 and 1999 respectively, making the total 9 as of the date this comic was published. Since then, Armstrong died in 2012, Mitchell in 2016, Cernan in 2017, Young on January 6, 2018, and Bean on May 26, 2018. The death of Bean kept the actual line almost in line with the 50% 'actuarial line', though it had generally been at least slightly higher prior to that. The situation by January 2025 sees the factual line stay at 4, taking it again beyond the 95% for at least the time being. The oldest living person to have landed on the Moon is Aldrin at 95. Also

living are Scott at 92, Schmitt at 89, and Duke at 89.

The chart assumes that no other humans will go to walk on another world within the time-frame plotted and the title text implies that this is primarily an economically determined decision. While noting that not exploring space is a justifiable and sensible decision which may also be made by many hypothetical cultures on other worlds, the text implies a grandness to a civilization that would be given the opportunity to discover, study and memorialize the 'one-world graves' of other civilizations by choosing to explore space despite the economic difficulty. This also implies that the likely consequence of not exploring space is that a civilization which chooses to do this is doomed to go extinct eventually while those which do explore and colonize may last long enough to be safely established on multiple worlds and discover the remains of civilizations which acted on a purely economic basis and hence ensured their own collapse. High five for exoplanet archaeology.

The current earliest opportunity to increase the line again would be NASA's Artemis III, planned for 2027 (delays possible).

## #894: Progeny

May 04, 2011



I tell my children 'it's not whether you win or lose, it's how you play the game.' I'm trying to take the edge off their competitive drive to ensure that I can always beat them.

## Explanation

This comic is a reference to IBM's computer Watson that beat humans at Jeopardy (see 1002: Game AIs). The IBM team created a computer that could formulate a response to a Jeopardy-style question. Jeopardy is a game played where the contestants are given the answer to a question, and must devise the question. A question might be "Its largest airport was named for a World War II hero; its second largest, for a World War II battle", to which the contestant must answer "What is Chicago?". When going up against two Jeopardy champions, Watson was able to beat them both (by some margin, although he did answer the above-mentioned question incorrectly with "Toronto").

Megan chimes in that we are "pretty awesome at teaching" which is very true. Humans are the best (on this planet) at teaching other things to do a set of tasks. We train dogs, cats, lizards[actual citation needed], birds, other people, and now we are getting quite good at teaching a computer, a simple machine completely of our own design, to mimic our own thought patterns and make decisions similar to what we would make. (See also 1263: Reassuring). It can also be argued that building a machine proficient in a task is equally if not more impressive than being proficient in the task yourself. Thus, humans have nothing less to be proud of.

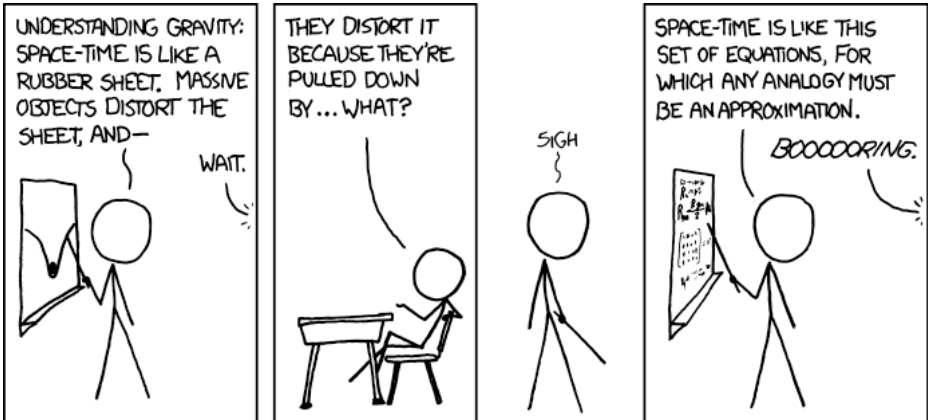
The title text makes fun of teaching our children values about not trying to win by any means (i.e. but while

playing fair) by suggesting we are just trying to hold on to our ability to beat them in something.



## #895: Teaching Physics

May 06, 2011



Space-time is like some simple and familiar system which is both intuitively understandable and precisely analogous, and if I were Richard Feynman I'd be able to come up with it.

## Explanation

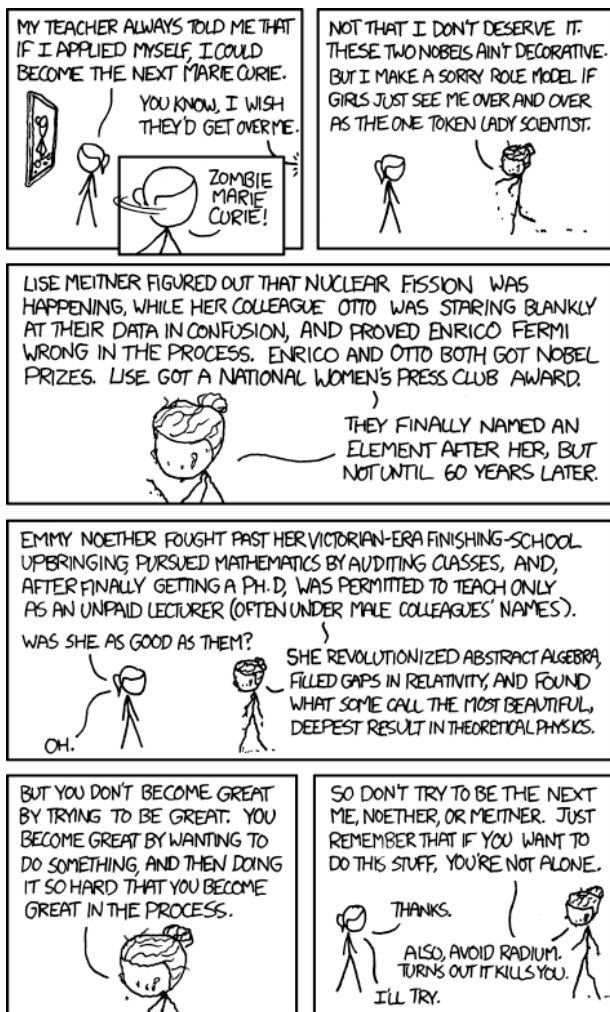
The comic makes fun at the idea that physics is only interesting because teachers use interesting analogies, despite the fact that they are over-simplified and don't help when more complex theory is taught. The comic refers to the classic "Ball on a rubber sheet" metaphor as a way to explain general relativity, even though the metaphor breaks when trying to explain what causes gravity. The fourth panel highlights this with the statement that space-time is a set of equations, for which no analogy can fully explain.

The title text continues the teacher's frustration with coming up with an analogy by stating that there is some analogy that is both understandable and precise, and if he were the famous physicist/teacher Richard Feynman he could come up with it. Professor Feynman was famous for his physics lectures and their ability to both entertain and educate his students, from the beginning student to the more advanced graduate students. Recordings of his lectures are still available and applicable to today's audience.

Another comic shows how to play with this 1158: Rubber Sheet.

## #896: Marie Curie

May 09, 2011



Although not permanently.

## Explanation

The comic begins with Ponytail stating that her teacher told her that if she worked hard (applied herself) she could be the next Marie Curie. But then a distorted zombie Marie Curie (drawn as zombie Hairbun) walks in and informs Ponytail that she is not the only influential woman scientist, and would wish people would get over her "as the only important female scientist". She then mentions two other important women in science.

Marie Curie was a pioneering research scientist, most famous for her work with radiation, and in isolating Radium, and Polonium. She died from aplastic anemia contracted from exposure to radiation from either the extremely radioactive isotopes of Radium and Polonium that she would carry around in her pockets, her work with (at the time poorly shielded and high-dose) field x-ray machines as a medic during WW1 — or both. She ends up warning Ponytail against exposure to radium, stating that it kills you, although as the title text points out, obviously not permanently as she came back as a zombie. Showing what just a few years of scientific advancement can do: neither Hahn nor Meitner ever got cancer despite working with radioactive material and both lived to 89 years old. Working with radioactive material and ionizing radiation can be done safely if one takes the right precautions – a view that Curie shared, but unfortunately for her, she did not yet know what those precautions were when she undertook her work. Hence her giving that parting advice.

The conversation between Ponytail and Zombie Marie Curie refers to the fact that Marie is often singled out as the only significant female scientist. Marie points out that this is a poor version of the truth, for two reasons. Firstly, there have been many other significant female scientists, and secondly, Marie asserts that the most significant events in theoretical physics and mathematics do not arise because of an individual's desire for fame, but from passion for the subject and a great deal of dedication and hard work.

As examples of important women scientists the comic mentions Lise Meitner and Emmy Noether.

Lise Meitner was one of the major contributors in the discovery of nuclear fission for which her male colleague Otto Hahn was awarded a Nobel Prize in 1944. In the process she proved that Enrico Fermi had made some wrong assumptions (ironically the Nobel Academy made the same mistake and awarded Fermi the 1938 Nobel Prize in Physics for something he was wrong about – Fermi had mistaken fission products for transuranium elements as Meitner proved), but he also got a Nobel prize whereas she only got a National Women's Press Club award as "Woman of the Year" in 1946. As a somewhat late consolation, the element Meitnerium was named after her in 1997 almost 30 years after her death. (She is later mentioned again in 1584: Moments of Inspiration).

Noether's Theorem is widely considered one of the most beautiful and significant theorems used in physics, and

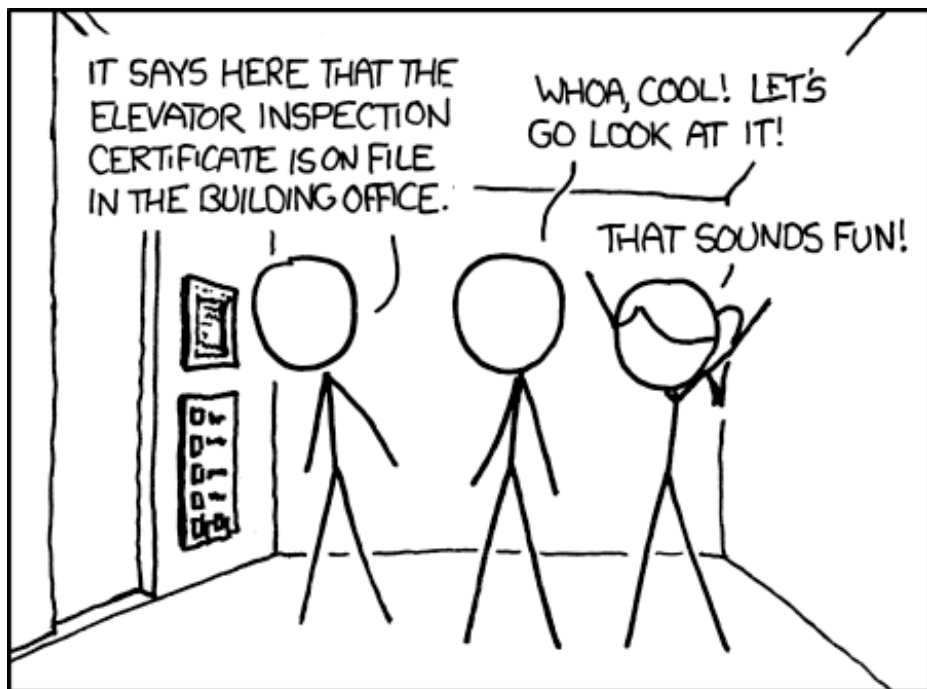
its repercussions are still being widely explored to this day. She had to learn mathematics by taking auditing classes at University of Erlangen since she was refused the opportunity to take classes because she was a woman. And later she had to teach without getting paid and under male colleagues' names, meaning that students would only take the course if they thought some "real" male teacher was guiding Emmy. Much later Emmy was referenced in the title text of 2595: Advanced Techniques.

Marie asserts at the end that Ponytail is not alone, meaning that there are many important female scientists out there, and also many young women wanting to become scientists. But could also be a reference to the fact that, as mentioned, female scientists might be less likely to receive medals or other tokens of support and encouragement.

Zombies are a recurring theme in xkcd, particularly zombie scientists, which has also occurred twice before with Richard Feynman in 397: Unscientific and Paul Erdős in 599: Apocalypse.

## #897: Elevator Inspection

May 11, 2011



INDUSTRY TIP: BUILDING OWNERS KNOW THIS NEVER HAPPENS. THOSE SIGNS MARK ELEVATORS WHICH HAVE NEVER BEEN INSPECTED.

Even governmental elevator inspectors get bored halfway through asking where the building office is.

## Explanation

This was the first of Randall's Tips, that was not a pro tip but more specifically an Industry tip.

In the United States, all elevators are subject to building codes and must be inspected on a somewhat-regular basis by city officials. After the inspector runs their rounds, the elevator's passing grade is noted in a certificate which is visibly placed in the elevator. Alternatively, it can be dumped in a filing cabinet in the building office where the owner can forget about it, and a placard is given to the elevator letting the passengers know where the certificate is (usually the aforementioned building office).

This comic is portraying a scenario which supposedly never happens. No-one is ever actually interested in seeing the elevator's certificate, and nobody gets this excited about going to a building office. So, as the caption humorously suggests: many elevators start using the placards for elevators that have not been inspected. No one cares enough to go to the building office and search the files for the certification that may not even exist. And as the title text says, even inspectors themselves get bored before they can get to the building office.

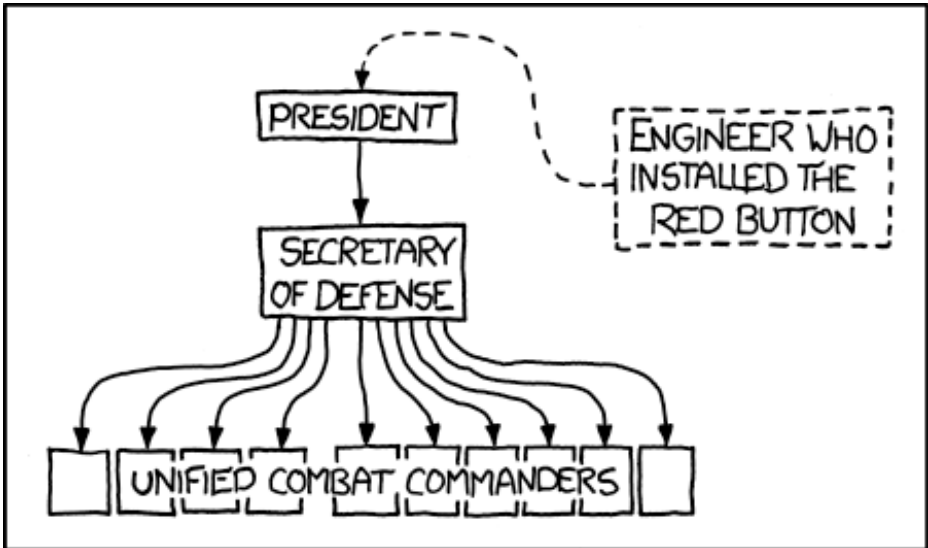
The moral of this comic is if you see an elevator with a notice that says that the "elevator inspection certificate is on file", you do not really know whether the notice is true, and so building owners use the certificates as



substitutes for the bother and expense of actually getting their elevators inspected. The flaw in this logic is that, if an elevator were to fail catastrophically, any actual inspection certificate would almost certainly be retrieved and examined as part of the investigation. If the elevator had not been inspected as required, there would be very serious legal consequences. Hence, failing to carry out regular inspections would carry substantial risks.

## #898: Chain of Command

*May 13, 2011*



### US NUCLEAR CHAIN OF COMMAND

Themistocles said his infant son ruled all Greece -- "Athens rules all Greece; I control Athens; my wife controls me; and my infant son controls her." Thus, nowadays the world is controlled by whoever buys advertising time on Dora the Explorer.

## Explanation

The President of the United States is at the top of the US Nuclear Chain of Command and can figuratively "press the red button" to start a nuclear war, but the engineer is de facto above him because the engineer is in charge of configuring how the button works, and thus could have installed an override so that they could block the President's use of the button and/or use it themselves. "Pressing the red button" is a metaphor for the complex set of procedures for the worst-case scenario, namely launching all strategic nuclear capabilities.

This paradoxical situation applies in many other fields. In a major corporation commercially sensitive information is generally hidden from employees at lower levels but available to management, but the systems administrator (who usually sits low on the hierarchy and doesn't manage any other employees) can access not only the sensitive information but the raw data that it's calculated from. Not only that, but the systems administrator is usually responsible for controlling who has access to the information - making them the most powerful person in the company (as far as the IT infrastructure is concerned). Many managers think of themselves as being "above" engineers and have trouble coming to grips with this concept.

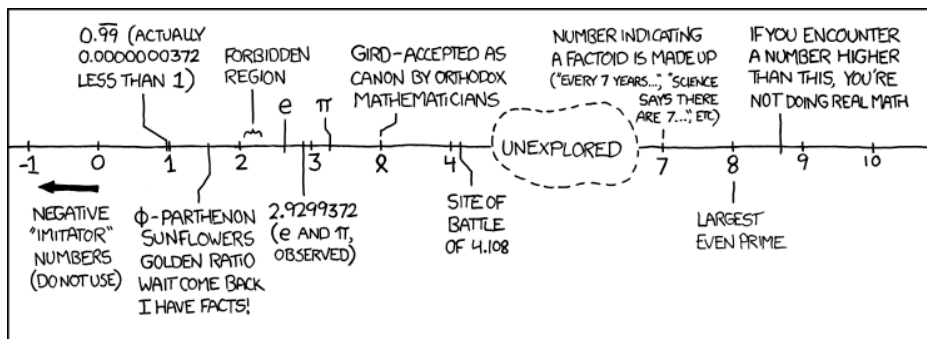
Themistocles, mentioned at the title text, was an Ancient Greek politician. In the title text is a similar joke placed at the top of the chain of command, this time in Ancient

Greece. It refers to Plutarch's Life of Themistocles:

The part about television advertisements is a proposal that, by controlling the "infant sons" of important political figures (as well as the aforementioned Red Button engineer), one could control said political figures, and thus the entire world. Dora the Explorer is a bilingual (Spanish/English) educational show for young children, something a busy person like the President (or the engineer) might turn on for their child, and advertisements are known to influence young kids' decisions.

## #899: Number Line

May 16, 2011



The Wikipedia page "List of Numbers" opens with "This list is incomplete; you can help by expanding it."

## Explanation

Once again, Randall seems to be just messing around, this time with a number line.

- Negative numbers have the same magnitude as positive numbers but can only be used to represent the removal of that same magnitude (hence the term "difference" being used for subtraction). Negative numbers may be called imitator numbers in the comic because of their similarities to positive numbers.
- $0.99\dots$  is equal to 1 because if you subtract any number from one, however small, you will get a number that is less than 0.99.  $1 - 0.0000000372$  is 1 bit less than the IEEE 754 32-bit floating-point representation of 1.
- The golden ratio or  $\phi$  (phi) is the number , about 1.61803. It has many interesting mathematical properties, mostly relating to geometry, and has occasional appearances in nature, such as spirals formed by the seeds in sunflowers. It is also subject to many less credible claims, such as the belief that phi appears in Parthenon (a well-disputed claim) or that rectangles proportioned after phi are more aesthetically pleasing. The speaker seems to drive off his listeners as soon as he brings it up; the golden ratio is infamous for being brought up by know-it-alls, which Randall has mocked in other comics.
- The approximate range from 2.1 to 2.3 is marked as The Forbidden Region. Why Randall marked this range as forbidden is really anyone's guess; it seems to

be an entirely arbitrary designation.

- $e$  (Euler's number) is 2.71828... and  $\pi$  (pi) is 3.14159265... and...
- 2.9299372 is roughly the average of  $e$  and  $\pi$ . It being listed as " $e$  and  $\pi$ , observed" is probably a President's Day reference. It is the average of  $e$  and  $\pi$  just as the American Presidents' Day is always observed on the 3rd Monday of February (between George Washington and Abraham Lincoln's birthdays). Washington and Lincoln were the 1st and 16th Presidents of the USA, respectively. Each has a celebrated place in American history.
- Gird, is a purely fictional number. (The glyph that Randall uses seems to resemble an older shape of the digit 4, such as seen on archaic maps.). The glyph bears some resemblance to the odal rune but given its associations (especially in the version with serifs) this was probably unintentional. Canon and orthodox could mean "accepted as the official story" and "most science-based followers", but most likely serve as reference to organised religions. Other fictional numbers include: (Which Gird may or (most likely) may not be a reference to)

Bleem - a fictional integer between 3 and 4

iCarly's Derf - a fictional integer between 5 and 6

George Carlin's Bleen - a fictional integer between 6 and 7

SCP-033 - a fictional "missed number" consisting of complex formulae that causes mathematical systems to

break down when it is introduced to them (manifesting as the physical destruction of the objects the mathematical formulae are contained in, such as paper and computers)

Saturday Morning Breakfast Cereal's Sorf - a fictional integer between 2 and 3 (Please note that this SMBC comic postdates this xkcd comic.)

- Site of Battle of 4.108 is another map joke, implying that 4.108 is an actual location, where an eponymous battle was previously fought. 4.108 was also referenced in 2861: X Value, though with an added 3 in the ten-thousandths place.
- An Unexplored region obscures the line approximately ranging all values from 4.5 to 6.7. In the days when the Earth was still being mapped out, territories that had yet to be properly explored and charted were labelled in a similar manner. The placement of the Unexplored region on the number line indicates that all numbers in that range, including the integers 5 and 6, are completely unknown. This is, of course, patently ridiculous,[citation needed] and the humor seems to derive solely from how nonsensical and unbelievable it is. Correspondingly, the digits 5 and 6 cannot be found in the comic.
- It is often the case in the media that "It has been 7 years..." or "In the last 7 years..." etc. It is made to seem like a believable statistic but cannot always be true. Alternatively, it is intended as an absurd joke that the number 7 is just "not to be believed".



- 8 is not the largest even prime number, nor is it a prime at all. The largest (and only) even prime is 2 (which is a subprime number). A joke intended for those who clearly know that the claim is false. (However, it is also possible that the number of numbers in the unexplored region is such that 8 is in fact now prime.)
- The last entry seems to be a reference to certain fields of pure mathematics, which focus less on performing calculations with numbers and more on understanding structures that may be described using logic. It finishes off the tone of the comic that seems to be shaping the number line terms of what is commonly useful to certain areas of applied mathematics, rather than a complete, accurate version of the number line.

A possible alternate reason for suggesting that any digit beyond 8 (i.e. 9) would not be 'real' mathematics is Benford's law. Taken at the level of individual digits, true data tends to have far fewer 9s in it than (in decimal representation) any other non-zero digit. While it would not be true to say that the presence of a 9 itself indicates invalid values, concocted or stochastically randomized values may have far more 9s than would naturally emerge from true data. Any use of those numbers would then be based upon lies, and highly suspect. The two-digit 10, also illustrated, might be excluded from any analysis of digit-frequency, or (prominently featuring a trailing zero) might further underline the point by being being more likely rounded to the nearest ten (or even a convenient order of magnitude), where its accuracy and precision are both more open to doubt than in the case of either 9 or

(also neighbouring it, though not shown here or necessarily subject to any comment) 11.

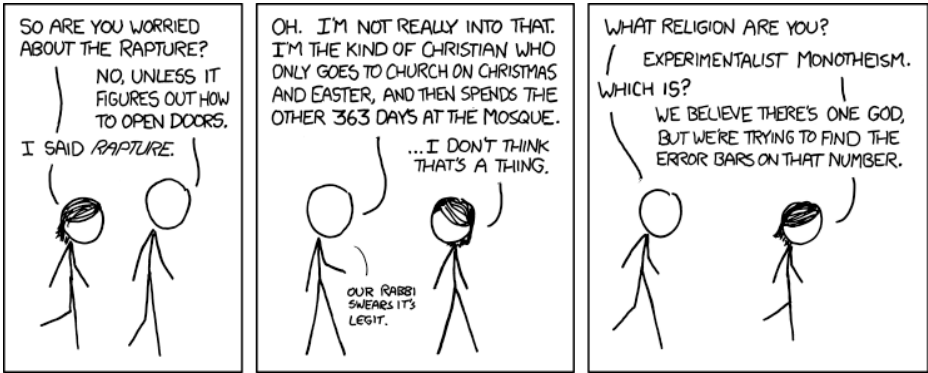
The title text is a literalism joke; at the time the comic was published, all Wikipedia articles with incomplete lists began with the message template "This list is incomplete; you can help by expanding it." In the case of the List of numbers page, one could infer the absurd notion that Wikipedia wanted to have the list include every number from negative infinity to infinity. But because all Wikipedia articles are necessarily finite, such a list would always be incomplete, no matter how much it was expanded. It may also be referencing his previous statements about Wikipedia being the home of compulsive list-makers, who make the most astonishingly complete lists imaginable.

As of 2022, Wikipedia's List of numbers page, as well as all pages including lists that cannot ever reach a state of completion, are headed by the message template "This is a dynamic list and may never be able to satisfy particular standards for completeness. You can help by adding missing items with reliable sources."

2956: Number Line Branch also features a number line with additional (fictional) numbers.

## #900: Religions

May 18, 2011



But to us there is but one God, plus or minus one. --I  
Corinthians 8:62.

## Explanation

The late Harold Camping, a Christian pastor, wrongly predicted that the world would end in May 21, 2011. Since it didn't, he moved the date to October 21 of that year, and when that passed uneventfully, he recanted his belief that the end time could be calculated. In the Christian belief, the end of the world is called "the second coming" (referencing the return of Jesus); some sects believe this will be preceded by an event called "the Rapture."

The first frame is a reference to raptors in Jurassic Park, and certainly not Randall's first raptor joke. In this film, the raptor dinosaurs get much more dangerous once they learn how to open doors.

In the second frame, Cueball describes his personal approach to religion, starting by saying that he is Christian but only attends church services on Christmas and Easter. This is a well-known phenomenon among lapsed Christians, and if Cueball is not a regularly practicing Christian, it would certainly explain why he isn't particularly interested in this fundamentalist aspect of Christian belief. However, from here, his description takes a turn towards the ridiculous, when he says that every other day of the year is spent "at the mosque". Not only are mosques the place of worship for a completely different religion (specifically, Islam), they also generally hold communal services only on Fridays, so for Cueball to present this practice so matter-of-factly is quite

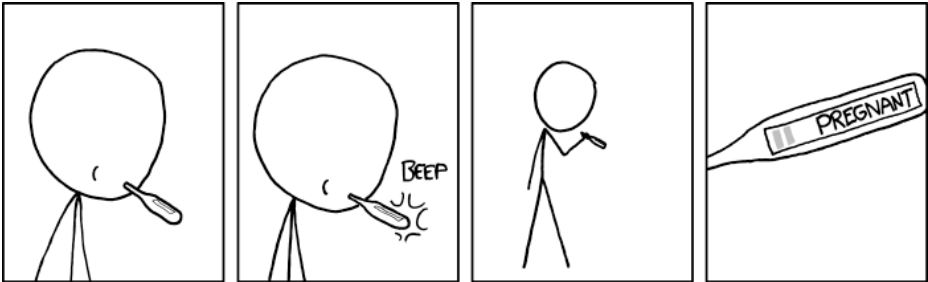
absurd. When Megan questions the ubiquity of his practices, he replies by saying that this practice is vetted by his rabbi - a spiritual leader in Judaism, a third separate religion. While all three of these are Abrahamic religions, and as such have some overlap in their beliefs and texts, combining them all into one religion would be far from a simple process; either Cueball is simply being contrarian for comedic purposes, or he is involved in a very strange religious sect indeed. It is possible that in the kind of Christianity he believes in, going to the mosque is an acceptable substitute for going to church, as depending on his location it might be impractical to go to church everyday, and that the religious bias of the place of worship for a different religion can be offset by consulting a third separate religion.

The third frame is a math joke in which Megan references error bars which are used on graphs to indicate the uncertainty. So, Megan believes in one God (monotheism), as she says in the comic. But if she is still trying to find the error bars, and from the title text it is "one, plus or minus one", that could be in the range of zero (atheism) to two (bitheism). With larger error bars, this could also reference the doctrine of the Trinity, which holds that there is "one God in three Divine persons": the Father, the Son (Jesus), and the Holy Spirit. Some consider this position to be polytheistic, as others would consider atheism to merely leave the number and nature of gods undefined (and, as a separate concept, agnosticism rendering it as untestable whatever the hypothetical value might be).

The title text is a supposed excerpt from the holy text of experimental monotheism. 1 Corinthians is a book of the Christian Bible. Megan refers to chapter 8 verse 6 ( $\pm 2$ ), which would be verses 4–8. Verse 4 says "...There is no God but one". Confusingly, verse 6 says "yet for us, there is but one God, the Father, from whom all things came and for whom we live; and there is but one Lord, Jesus Christ, through whom all things came and through whom we live." (That could be self-consistent if the passage assumed that Jesus Christ is a lord but not a god, but little, if any, mainstream denominations of Christianity seem to follow such a doctrine).

## #901: Temperature

*May 20, 2011*



And the baby has a fever.

## Explanation

This is a play on the fact that many digital thermometers look similar to pregnancy tests. Cueball, perhaps feeling ill, thinks he is using a thermometer to measure his body temperature and determine if he has a fever. As he is taking it orally, he is doubtless surprised when the thermometer tells him instead that he is pregnant.

The two bars on the 'thermometer' are the traditional lines that appear on a common type of pregnancy test. One bar is the control line; it will become visible given any normal urine sample. If it doesn't appear, the test has been invalid. The other bar, the test line, reacts to human chorionic gonadotropin, a hormone that's released during pregnancy. If both lines become visible, the test result is positive; if only the control line becomes visible, the test result is negative. Other results are invalid, since the control line didn't appear. This type of visual indicator, for both pregnancy and other testing processes, is so well understood that even the more complicated lateral flow readers with circuitry to detect nuances and a simple LCD display to announce the results will often feature a "one or two bar" display, either as a window on the actual "test line" strip or reproduced (as with this example) on the electronic output.

Depending upon the model, an actual thermometer may include a series of bars, alongside a set of readable digits, more displaying at higher registered temperatures. These may emulating the way various types of traditional



thermometer have the indicating liquid filling their stem past graduations, but, being necessarily of coarser precision than a value, perhaps only as a gimmicky visual metaphor or else to clearly highlight temperatures that are significant or out of range (e.g. the top bars shaped as the words "fever" and "error", if ever they are displayed during use/mis-use of the device). It is unknown what just two bars would indicate, if they were shown on a true digital-display thermometer, but the placement suggests it could have meant a measurement above room(/ambient) temperature but nowhere near expected body temperature.

Thermometers are typically used to measure temperature, and the title text notes that this clever thermometer has also detected a fever in the baby, presumably somewhere inside Cueball. 3001: Temperature Scales discusses units of measurement.

## #902: Darmok and Jalad

May 23, 2011



I wonder how often Patrick Stewart has Darmok flashbacks when talking to Star Trek fans.

## Explanation

This comic is a parody of the *Star Trek: The Next Generation* episode "Darmok" in which Captain Picard and the Enterprise crew meet with a Tamarian ship. They can translate the individual words of Tamarian with perfect accuracy, but the Tamarians communicate using metaphors based on their own history and culture—without these cultural references, the Enterprise crew are unable to understand what the Tamarians are actually saying. The Tamarian captain deliberately strands himself and Picard on a planet, repeating the phrase "Darmok and Jalad at Tanagra". Ultimately, Picard realizes that the line refers to a story of two warriors marooned on an island (Tanagra) who work together to defeat a common foe. The alien's intention is that he and Picard work together to defeat a predator as a way to cement ties between the Tamarians and the Federation.

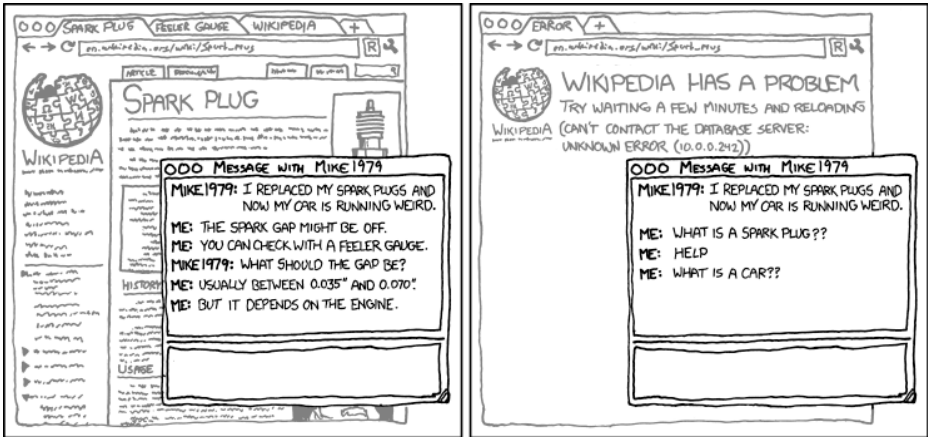
In the comic, instead of suggesting a dramatic gesture to achieve a diplomatic breakthrough, the alien seems to be suggesting a one-night stand, hence the wink in the final panel. It is not clear if he is chatting up Deanna Troi (who has the long curly hair) or Picard. However, given that in the original episode Darmok and Jalad (the two warriors) were metaphorically identified with Dathon and Picard, it seems likely that he is flirting with Picard.

The title text suggests that the actor Patrick Stewart, who played Captain Picard, might find *Star Trek* fans

indecipherable, in the same way that Captain Picard found the Tamarians indecipherable. This is a joke about how Star Trek fans stereotypically make constant references to the franchise which are so dense and obscure that even the program's actors might find them impossible to understand. This tendency is parodied in the film *Galaxy Quest*, a whole-work expy of the Star Trek phenomenon, in which the original actors need to consult their more dedicated fans how extremely faithful real-life alien reconstructions of the original fictional sets and equipment actually operate.

## #903: Extended Mind

May 25, 2011



WHEN WIKIPEDIA HAS A SERVER OUTAGE, MY APPARENT IQ DROPS BY ABOUT 30 POINTS.

Wikipedia trivia: if you take any article, click on the first link in the article text not in parentheses or italics, and then repeat, you will eventually end up at "Philosophy".

## Explanation

This comic refers to the fact that the narrator has become so dependent on Wikipedia as a source of information that although it gives him the great advantage that he appears learned on any topic with a remarkable degree of specificity, the downside is that whenever Wikipedia goes offline, the limitations of his actual knowledge are revealed. Note: if he had downloaded Wikipedia using a tool like Kiwix, he could have appeared smarter even when Wikipedia was down.

The title, "Extended Mind", refers to a theory proposed by philosophers Andy Clark and David Chalmers, which postulates that the mind not only includes what can be found in the skull, but also incorporates external things, like Wikipedia. Others have connected this sort of thing to the innate biological intelligence, or knowledge, but still consider it a different phenomenon under a label such as "extelligence".

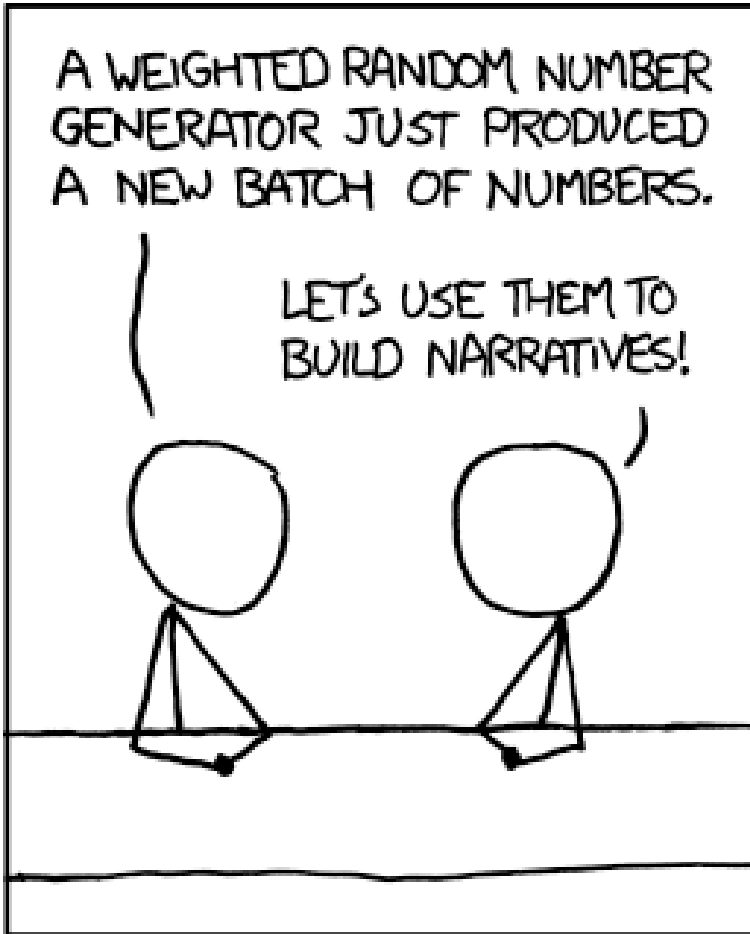
The title text refers to an observed phenomenon that many of Wikipedia's page links eventually lead to the Philosophy page, though he incorrectly states that this happens on all articles. This may be due to the fact that the first few links in any article tend to reference more general or abstract ideas, which eventually gravitate towards philosophy. This is only true for around 95% of Wikipedia pages: the rest end up in infinite loops, missing pages, or pages without links. As of 12:08 UTC on April 12, 2024, the Philosophy page leads into a loop

containing the pages Existence and Reality.

More info on this bizarre characteristic of the encyclopedia can be found on their page about it or on this blog.

## #904: Sports

May 27, 2011



ALL SPORTS COMMENTARY

Also, all financial analysis. And, more directly, D&D.



## Explanation

A random number generator is any object or program that arbitrarily selects and produces a number from within a pre-defined range of numbers. For example, a single six-sided die will produce any integer between 1 and 6, inclusive. In an unweighted random number generator, every number that it can possibly produce has the same odds of coming up. When rolling a single precision die, for instance, there is an equal chance of rolling a 1, 2, 3, 4, 5, or 6. Conversely, in a weighted random number generator, some numbers are more likely to come up than others. For example, when rolling two dice, a seven is far more likely to come up than a two, as there are six possible ways to roll a seven but only one way to roll a two.

All sports generate numbers that are inherently random. Home runs, goals, sacks, passes, shots, hits, misses, errors, and many more such statistics are generated in every match of every sports game. The rules of the particular sport, as well as the skill of the participants, introduces bias toward certain values; hence, sports matches are weighted random number generators.

If the generator is weighted to favor a specific team in a specific game, that is discussed. Then the results of the game (more random numbers) are discussed. It's the discussion that is the narrative part. If a player breaks a record, that becomes part of the narrative. The number is random, but weighted because of player skill or the rules

of the sport.

College sports in the US are especially prone to this kind of narrative-first journalism with their penchant for using more arbitrary systems of placement to determine postseason play than professional sports which have almost all standardized their systems around sometimes highly complicated metrics to determine who reaches the postseason. Prime examples of this are the new College Football Playoff which has a committee release polls every week after Week 9 of the college football season, with the top four teams in the final poll playing for the championship, and March Madness where a similar committee ranks the top 68 teams in the country in a bracket for the championship tournament. The old Bowl Championship Series, which determined the NCAA Division I college football champion from 1998 to 2013, literally used computers generating numbers and algorithms based on team performance as a heavy part of their ranking systems that determined which two teams played for the championship at the end of the season.

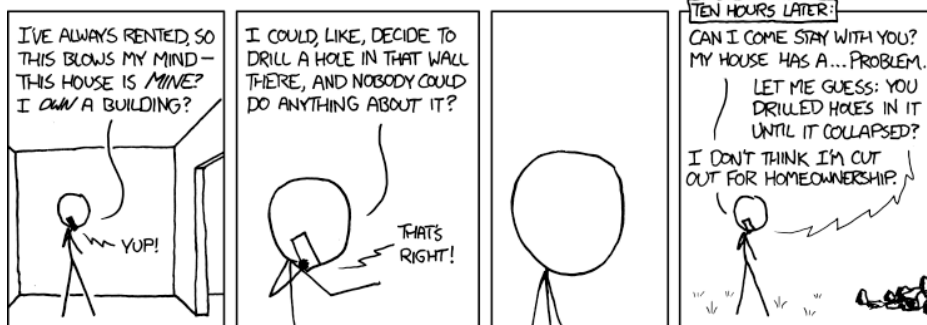
The title text applies this to financial/stock results/forecasts as well and, most appropriately, to Dungeons & Dragons (D&D), a tabletop role-playing game. In D&D the players and Dungeon Master are forging a narrative about the characters and world they have collectively made up; the players all decide on courses of action (such as negotiating with townspeople, intimidating nobles, attacking monsters, to name a tiny fraction of possibilities) and whether they succeed is determined by rolling dice of various numbers of sides.

The numerical results are woven into a narrative by the Dungeon Master.

This strip is one of several in which Randall affectionately trivializes sports (see for instance 1107: Sports Cheat Sheet, 1480: Super Bowl and 1507: Metaball).

## #905: Homeownership

May 30, 2011



New research shows over 60% of the financial collapse's toxic assets were created by power drills.

## Explanation

People who live in rented properties often face the annoying problem of being unable to make simple changes to their dwelling — for example, drilling a hole in a wall to hang a picture — unless they first gain permission from the property owner. In many cases, if the renter drills the hole without asking permission, they will be charged for repairs.

This is one reason that home ownership can be empowering, as it allows the owner to do anything they wish with their property (at least, within the limits of the law). In this comic, we see Cueball (possibly the same Cueball seen in 616: Lease), struggling to come to terms with the realization that he now owns a home and can do anything he likes to it, such as drilling holes in the wall.

Unfortunately, Cueball gets so carried away with exercising this particular freedom that he drills too many holes in the house, and it collapses due to structural instability. Despite this being an unusual thing to do, it is apparently not unusual for Cueball, as the person he talks to on the phone immediately guesses what happened. Alternatively, it may be that Cueball's friend already made exactly the same mistake and is speaking from experience. Cueball's last statement expresses the fact that he was actually better off having someone who could dictate what could and could not be done with his residence, as then this wouldn't have happened.

The title text references fictional research showing that 60% of the toxic assets involved in the collapse of the United States housing bubble were created by power drills. A toxic asset is a financial asset for which the market has collapsed, such that it can no longer be sold. However, in this context it is also a play on the double meaning of the word "collapse", which can also refer to structural collapse. The implication is that the reason people couldn't sell their houses is because they'd drilled them full of holes to the point of structural instability, just as Cueball did.

## #906: Advertising Discovery

June 01, 2011

### ADVERTISING DISCOVERY:

TURGIDAX® TRIPLES <sup>[2]</sup> YOUR PENIS SIZE  
OVERNIGHT, <sup>[2][5]</sup> IMPROVING BOTH YOUR  
SEXUAL ATTRACTIVENESS <sup>[2][7]</sup> AND YOUR  
CARDIOVASCULAR HEALTH. <sup>[7][8][9]</sup>



WIKIPEDIA HAS TRAINED US TO BELIEVE ANYTHING  
FOLLOWED BY LITTLE BLUE NUMBERS IN BRACKETS.

When advertisers figure this out, our only weapon will be  
blue sharpies and "[disputed]".

## Explanation

On Wikipedia, a well-referenced text or statement indicates credibility. References for particular facts are linked to by bracketed little blue numbers in superscript. When faced with a statement followed by these, readers will normally believe it without further ado, since they take it on trust that there are directions on the bottom of the page, leading to a reliable source or two, agreeing with what the statement says. The effect becomes strengthened when such information is often confirmed to be correct.

In the comic, Cueball reads part of an ad for a penis enlargement drug. As the footnote numbers are not a contiguous sequence starting from 1, the ad contains other content before the shown portion.

Advertisers have realized that it has gone so far that people in general will take any nonsense for granted if there is just the right amount of Wikipedia-style reference tags to it. The penis enlargement e-commerce business can suddenly flourish (again?) and the spammers won't even need to bother making up findings to cite.

Turgidax® is something Randall formed from turgid, meaning swollen. One reason that the attaching of -ax creates a typically pill-like name is simply that -ax (and -ex) are common Latin adjectival word endings, and that many drugs have names formed from Latin words. -Ax is



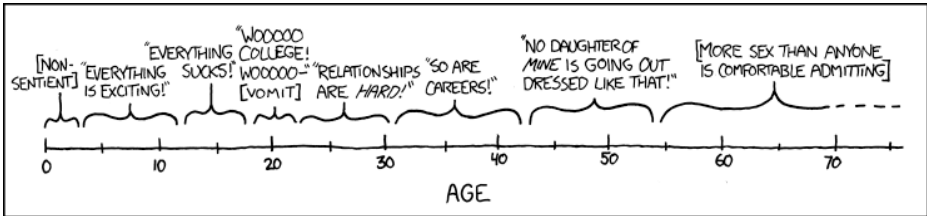
also, specifically, the root of the -acious ending in English, as in "audacious" or (appropriately) bodacious, meaning "extra" or "especially". Therefore, the name suggests that the drug causes male genitals to become extra or especially turgid.

Cardiovascular means relating to the heart and blood vessels. While it is plausible that the enlargement of genitals could increase sexual attractiveness, unless it is so excessive as to cause an unintended effect, enlargement itself is unlikely to affect cardiovascular health.

The title text is about how Wikipedia users have been able to add "disputed"-tags (nowadays "disputed – discuss") after challenged facts, with this template, since the dawn of time.[disputed – discuss] So when faced with the new advertising trick IRL, we could counter by scribbling those tags all over with blue Sharpie marker pens, and so automatically revive the critical thinking.

## #907: Ages

June 03, 2011



Every age: "I'm glad I'm not the clueless person I was five years ago, but now I don't want to get any older."

## Explanation

This is a graph of the general themes that occur between the ages covered by each individual set of brackets. The layout is a parody of larger timescales of human or geologic history, e.g. "Bronze Age" or "Iron Age".

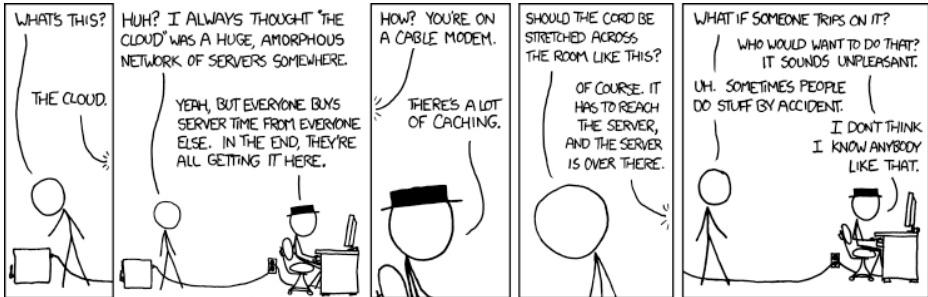
The "ages" identified and experiences typical at that age:

### **Table of "ages" identified and experiences typical at that age:[edit]**

The title text is a joke about the shortsightedness of many people (at any age) in believing their current age to be ideal.

## #908: The Cloud

June 06, 2011



There's planned downtime every night when we turn on the Roomba and it runs over the cord.

## Explanation

This comic is a reference to all of the companies that rolled out "cloud" services like Google's and Amazon's music service and Apple's aptly named iCloud online backup service around the time that the comic was released. Despite the mental image people using cloud services have of their data being placed literally in the sky, the reality is that all the data in the cloud has to be stored somewhere, sometimes being merely a server. Black Hat claims that the various cloud services are all ultimately provided by his server.

When Cueball expresses skepticism that Black Hat has enough bandwidth to make that possible, he explains that it's done by caching. Caching is an arrangement whereby some data is stored locally in order to reduce the need to retrieve it from more distant storage. However, it would require an unrealistically efficient level of caching to reduce the overhead requirements of the world's cloud storage networks to a level that could be accommodated by Black Hat's non-Enterprise class cable modem -- and if it could be done, it would simply transfer the load to other servers (i.e. Cueball's description of "the cloud" as it exists in the real world). However, it does make a bottleneck at Black Hat's server.

The last two panels showcase both Black Hat's stereotypical sadism and callousness. When Cueball asks about the hazard (namely, tripping) implicit in a cord stretching across a room, Black Hat responds by

implying no one would want to do that, because it's unpleasant. Cueball responds with the fact that some people do things by accident, to which Black Hat says he doesn't know anyone like that. The only way Cueball can disprove this (at least quickly) is by admitting he's one of those people, opening him up to Black Hat's ridicule. Alternatively, this could be a hint towards how Black Hat, being the sadist he is, would "accidentally trip over" the cord, purposefully causing downtime and subsequent unpleasantness to those who rely on the cloud, a proposition supported by the title text.

The title text refers to the Roomba, which is a small round battery-powered vacuum cleaner that runs automatically around the house. The Roomba begins to learn the dimensions of rooms, however, apparently it has never learned to avoid running over the cord, pulling it free of the socket and cutting power to the server.

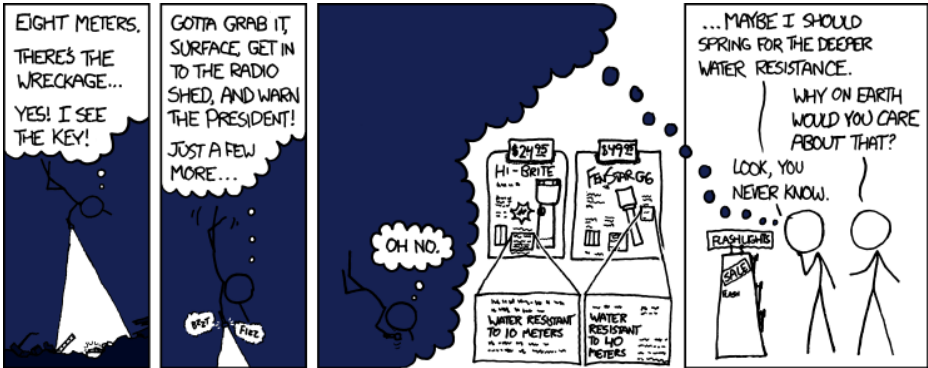
The regular nightly downtime is a reference to an urban legend in which some critical piece of equipment (often a server) is unplugged regularly so that a vacuum cleaner or similar janitorial tool can be temporarily plugged in. Although the Roomba vacuum does not require this computer's outlet, "running over the cord" apparently causes similar interruption in service, probably unplugging the cord, requiring it to be plugged in again.

This comic is reminiscent of a scene in the British sitcom *The IT Crowd* in which the IT department pranks their non-tech-savvy manager by presenting a single small box and claiming that it contains the entire Internet.

There are some connections with both 1117: My Sky and the title text of 1444: Cloud and especially the April Fools' Day comic 1506: xkcloud.

## #909: Worst-Case Shopping

June 08, 2011



Wait a minute. If I'm escaping from a submarine at 50 meters, then I'll \*definitely\* need a flashlight to find air pockets for gradual decompression on the way up. Time to start shopping professional dive lights.



## Explanation

For most people, under most circumstances, a flashlight's water-resistance is a completely moot point, as most flashlight use occurs on dry land. But, as Randall has shown before, there is a tendency for people to imagine elaborate scenarios in which an extra edge would be useful.

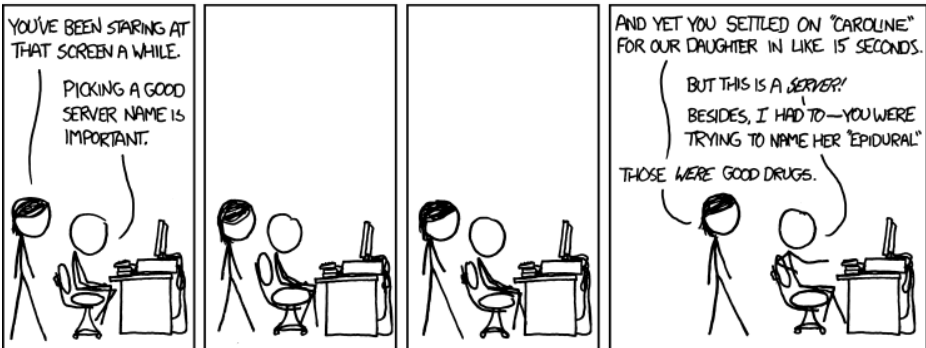
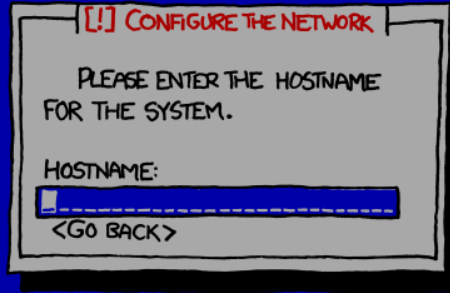
In the dream sequence over the first 2 and a half frames, Cueball appears to be diving to find a key underwater, which he spots using his flashlight when he is at 8 meters. His flashlight goes out at 10 meters because he bought the "Hi-Brite" model. The dream sequence also references a "radio shed", which were only really used in the past for amateur radios or some other military style bases/compounds—which would align with his "warn the President" line. He thus suggests the more water-resistant flashlight. However, this is seen as ridiculous from his friend, since the more durable model costs over \$25 more in return. He replies that "you never know" what situation you'll be in.

The title text takes Cueball's thought process to the next level. If he is getting a flashlight that works to 40 meters (worst-case), he should probably be prepared for even deeper waters as well (even worse-case).

This comic is similar to 761: DFS.

## #910: Permanence

June 10, 2011



This hostname is going in dozens of remote config files.  
Changing a kid's name is comparatively easy!

## Explanation

On the top panel is the sketch of a Debian Installer showing a hostname dialog for its menu-driven frontend. Cueball wants to make sure that he chooses a great permanent name that he can give to the server he is running.

Choosing a name for a server is an important task.

It is non-trivial enough that there are official communications on how to choose a good name and why many ideas are bad, for example RFC 1178 Name Your Computer.

It is important to pick a good name because changing it is costly once references to the existing name are widespread. For example, RFC 1178 states:

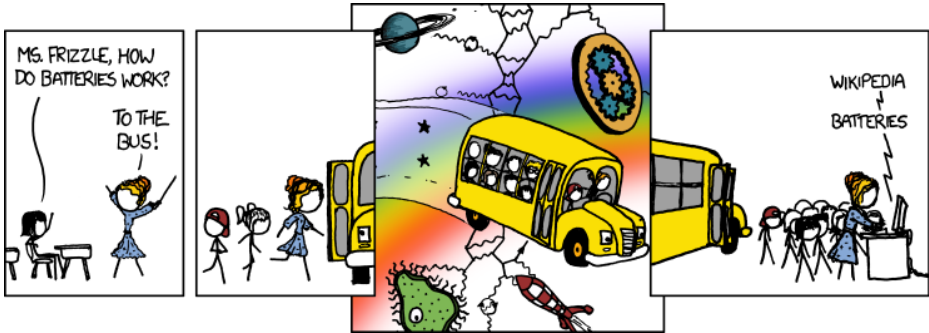
When Megan quips about how quickly, in comparison, Cueball named their daughter Caroline (a living being - that is, the type of entity that would give the server purpose), Cueball retorts that he was under pressure at the time: Megan tried to name said daughter "Epidural" in honor of the painkiller drugs that were being injected into her spine at the time. Megan tries to justify this by explaining that those were very good drugs, but thus also confirms Cueball's point, in that she was drugged and thus not making good decisions. Epidurals work by stopping nerves in the spinal cord from transmitting signals, and would not have an effect on the brain similar to those seen in someone given an opiate or narcotic. She

may, however, have been motivated purely by the fact that the drug stopped the pain of labor or a cesarean section; alternatively, she may have been on entirely different drugs at the same time.

In the title text Cueball mentions that he thinks that it is easier to change a person's name than to change the hostname of a server because of the number of changes that would need to be made to each of the machines that would have saved the old name of the server. It seems that Cueball hasn't realised that a child's name will get logged in government records, school records, and pretty much anything they sign up for and anything they buy or sign. (Of course, many of those documents will be changed by other organizations, making them somebody else's problem. Depending on the exact set of documents which Cueball needs to personally update, changing a name might be easier for him). Also, you typically have to wait in line at the Social Security Administration office or at the Department of Motor Vehicles, both of which take excruciatingly long amounts of time.

## #911: Magic School Bus

*June 13, 2011*



At my OLD school, we used Microsoft Encarta 2005.

## Explanation

The Magic School Bus is a series of educational children's books in the US that was adapted in the mid-nineties into an animated television show. The series centers on a class of children whose teacher Ms. Frizzle makes use of the titular magic school bus to take her students on a variety of magical field trips that allow them to experience various scientific topics first hand, such as the inner anatomy of the human body, the effects of friction, what goes on inside a beehive, and many others.

In this comic, however, Ms. Frizzle initially takes the students onto the bus apparently for one of these field trips to explore the way batteries work, but then for whatever reason, she has the students get off the bus again and simply resorts to looking up the Wikipedia article about batteries. The implied joke is that, with the advent on resources like Wikipedia, it's no longer necessary for Ms. Frizzle to take the students on half-hour long trips in the bus to experience whatever phenomenon they are studying that day (which is what the third panel symbolizes) - Wikipedia effectively answers the question quickly and easily. An alternative answer is that Ms. Frizzle has just gotten lazy, and has resorted to looking up the answers to the students' questions on Wikipedia instead of taking them on field trips. The alternative seems more likely, since the third panel shows them still going on an adventure, however briefly it takes to get to the library/computer lab.

The red and white checkered rocket in the bottom-right of the third panel can possibly be a reference to *The Adventures of Tintin Destination Moon* and *Explorers on the Moon*, in which Tintin goes to the moon in a rocket that is similar, if not identical, to the one depicted. To the bottom-left is a green Ciliate, a single celled life-form covered in hair-like fibres. At the top right are a set of Planetary gears. To the top left is a ringed planet, perhaps Uranus and in the background is a complex Feynman diagram.

The child who is asking the question looks similar to Wanda, one of the regular students in the class who often asked the questions that set the field trips in motion. Ralphie, the student in the second panel with the backward hat, was another student who often asked these questions. The students in the class were shown to be from many backgrounds (i.e. some of the students were black, another was Asian, etc.), something Randall appears not to have added into this comic, despite it being in color.

The title text is a reference to Phoebe, one of the students in Ms. Frizzle's class, who would regularly make a remark beginning with "At my old school..." (Phoebe used to go to a different school, unlike many of the other students in the class) to express wonder at how unusual were the events of Ms. Frizzle's field trips (e.g. "At my old school, we never rode on bees!"). This was frequent enough for said school to literally mark itself as "Phoebe's Old School" in one episode.[actual citation needed]

Microsoft Encarta 2005 was a digital encyclopedia that was often used in school settings for learning with the aid of computers. Arguably, with the advent of Wikipedia, programs like Encarta have become relatively less widely used, which is part of the joke in the title text.



## #912: Manual Override

*June 15, 2011*



I think you mean 'GNU Info Override'.

## Explanation

There are two jokes in this comic. The first is that the pilot typed "man override" to manually override the plane's computer and steer the plane to safety, but instead he ends up opening the manual page for "OVERRIDE". The second joke is making fun of a trend in documentation for Unix-like systems using the free GNU toolchain.

Historically, UNIX systems had a way to access descriptions of the available programs by using the "man" command (from "manual"). Typing "man [program name]" would output a concise, helpful text, called a "man page", describing the program's functionality, available command-line options, a list of related programs, etc. For some GNU-based systems, however, the output of "man [program name]" will be entirely too brief, mainly telling what the program does, then directing the user to invoke a GNU-specific information system (GNU Info). GNU Info pages can be quite useful, e.g. they often contain much more information than man pages, and are hypertextual, allowing quick navigation through a network of content-related Info pages; however, they often are much more complex to search through than simple man files, which take the form of single scrollable pages, one per program.

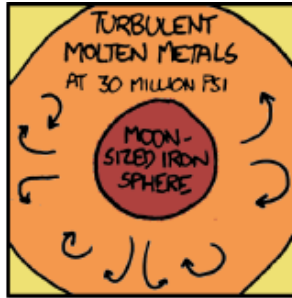
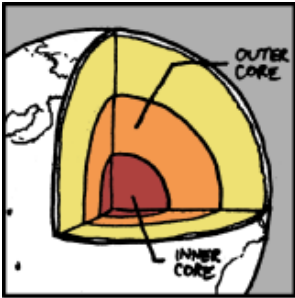
As such, the humor is predicated upon understanding the frustration which sometimes arises when GNU users seek out a man page, hoping for an easy, digestible read,

only to find that the man page they opened merely redirects them to another, less accessible network of hypertext Info pages. This can be especially annoying when it interrupts a person's workflow; e.g. when what they wanted was to spend three seconds looking up the proper format of a particular command line function, and instead they end up redirected to a maze of detailed documentation. This would be especially dangerous when one is trying to stop a plane from crashing.[citation needed] To add injury to the insult, sometimes the Info pages aren't actually installed, causing the "info" viewer to just render the same old "man" page that had the directions in the first place.

The title text provides a tongue-in-cheek correction to the comic's title, suggesting that rather than typing "man(ual) override", the user/pilot should type "info override" to search GNU Info instead.

## #913: Core

June 17, 2011



I FREAK OUT ABOUT FIFTEEN MINUTES INTO  
READING ANYTHING ABOUT THE EARTH'S CORE  
WHEN I SUDDENLY REALIZE IT'S *RIGHT UNDER ME*.

If you're a geologist or geophysicist and you don't introduce yourself by saying your name, then gesturing downward and saying "...and I study that", I don't know what you're doing with your life.

## Explanation

This comic reflects on the fact that no matter where you are on Earth, its core is always directly under you, while incredibly hot and under huge amounts of pressure. Yet most of the time, we ignore this completely unless there is a volcanic eruption (which has nothing to do with the core, but mainly with the friction between the tectonic plates).

Cueball is presumably reading a geology book with diagrams and various facts about the Earth's interior, such as the core being subdivided into an inner core and an outer core, that the inner core is a solid ball, the size of the moon, that the outer core is at a pressure of 30 million pounds per square inch (approximately 2 million times atmospheric pressure at sea level) and the outer core is made of molten metal in a constant turbulent motion - a bit like a pot of boiling water. But every time he gets 15 minutes in to such a book he freaks out, realizing this deadly stuff is right beneath him, and he bends over to look down to the Earth.

The title text makes a note of how cool it would be to study this and be able to tell people you study what they're standing over... always! So if you do - then let everyone you meet know what you do for a living as soon as you introduce yourself by pointing at the ground beneath you! (Despite most geologists and geophysicists not studying the core, they do study what is beneath our feet.)

## #914: Ice

June 20, 2011



On the plus side, she wrote 'Welcome to the AAA Club!' in lipstick on the bathroom mirror, and left me a membership/roadside assistance card on the counter.

## Explanation

This comic is a reference to an old urban legend: a guy is drugged (often after being approached by a flirtatious woman), then he awakes in an ice-filled bathtub only to discover that either one or both of his kidneys have been harvested by organ thieves.

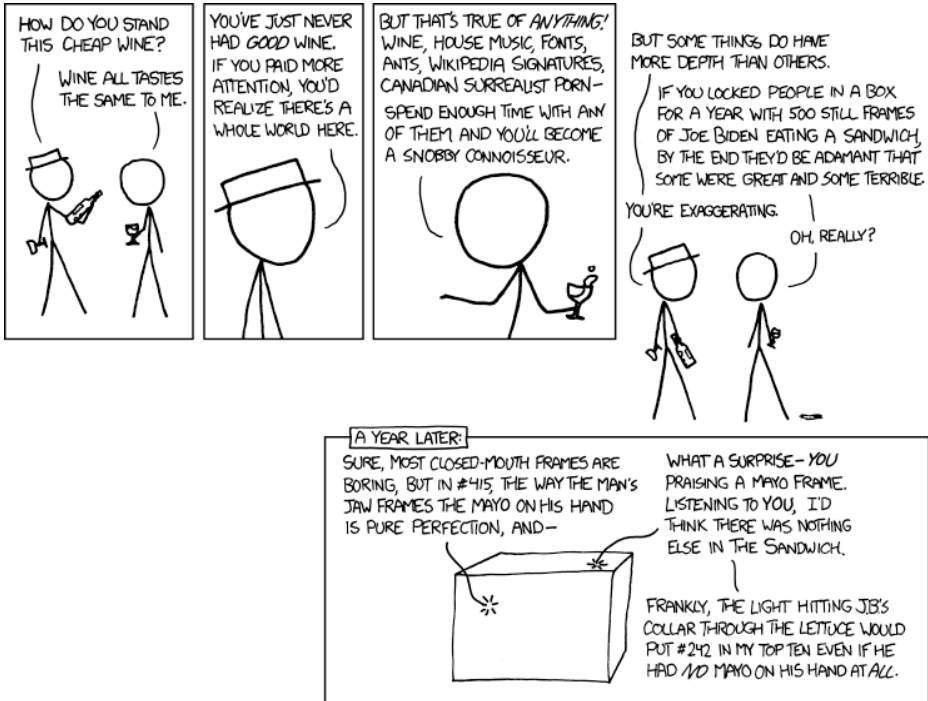
In this comic the situation is reversed: Beret Guy is bringing ice to a party, when he's lured by Danish up to "her place" and drugged. The next morning he awakes in a bathtub filled with kidneys, realizing that his ice has been stolen.

The title text refers to a similar story where the victim is left a note by their captor or one-night stand that says "Welcome to the AIDS club". Rather than having been involuntarily infected with HIV/AIDS, the victim, Beret Guy, has been involuntarily enrolled in the American Automobile Association (AAA) and his roadside assistance card has been left on the counter. This could also be another pun on Beret Guy's response of yelling AAAAAAA, which could be another kind of AAA club that he is welcomed to.

There is no display of typical "Beret Guy behavior" in this comic, although it is typical for him to be involved in an incident that turns the world upside down. His encounter with organ thieves only cost him his ice, a party and that he got a nasty experience. But he retained his kidneys and was not infected with HIV (probably).

## #915: Connoisseur

June 22, 2011



Our brains have just one scale, and we resize our experiences to fit.



## Explanation

White Hat is fond of good wine, and he can probably distinguish slight differences in different types of wine, perhaps being the type that attends wine tasting parties. He doesn't like the cheap wine that Cueball has served for him (implying a cheap wine cannot be a good one, an opinion held by stereotypical wine snobs), looking with disgust at the label of the offending bottle. On the other hand, Cueball doesn't have a preference; all of them taste the same for him, so presumably he gets the cheaper ones. White Hat tells Cueball that if he just tried some really good wine and paid more attention he would discover a whole new world.

Cueball's answer is the main message of the comic. He says that you can spend enough time focusing on the details of anything and develop an appreciation for the nuances. He lists a number of random categories that this is true of: house music, fonts, ants, ending with Wikipedia signatures and Canadian surrealist porn. He claims that, if you spend enough time focusing on any one subject, then you'll become a snobby connoisseur on that topic. This implies that wine drinking is simply a random hobby, no more valuable than any other.

White Hat does not seem to like this implication, and claims that some things have "more depth" than others. In many western societies, wine appreciation is a class signifier, and is treated as a mark of culture and education. White Hat appears to embrace this mindset,

implying that there's an inherent quality in learning to distinguish "good" from "bad" wines, and that failing to do so means missing out on valuable experiences. Cueball counters this, maintaining that that same level of appreciation could be taken from any experience. As an extreme example, he chooses something as obscure as 500 pictures of Joe Biden, then Vice President of the United States under Barack Obama, eating a sandwich. He claims that if people were locked up in a box with those pictures for a year (therefore being forced to focus on them, for want of other stimulation), they would end up being connoisseurs with the same vehemence regarding which pictures are good (and what makes a picture good) as any wine connoisseur.

White Hat claims that this is an exaggeration, but Cueball takes this as a challenge so in the last panel, apparently White Hat and Cueball are actually running this experiment. The final panel shows a box containing at least two people arguing over the relative qualities of what appear to be the photos Cueball referenced earlier. The argument sounds very much like a pair of wine aficionados debating which vintages are best, displaying strong opinions about minute details and invented categories. Specialized interests and the people involved in them are used again, with ants being the subject of 1610: Fire Ants, typefaces in 590: Papyrus and 736: Cemetery, plastic straws in 1095: Crazy Straws, porn-video quality in 598: Porn, and common colds in 2535: Common Cold Viruses. In 1534: Beer, Cueball also argue slight differences in alcohol brands don't make

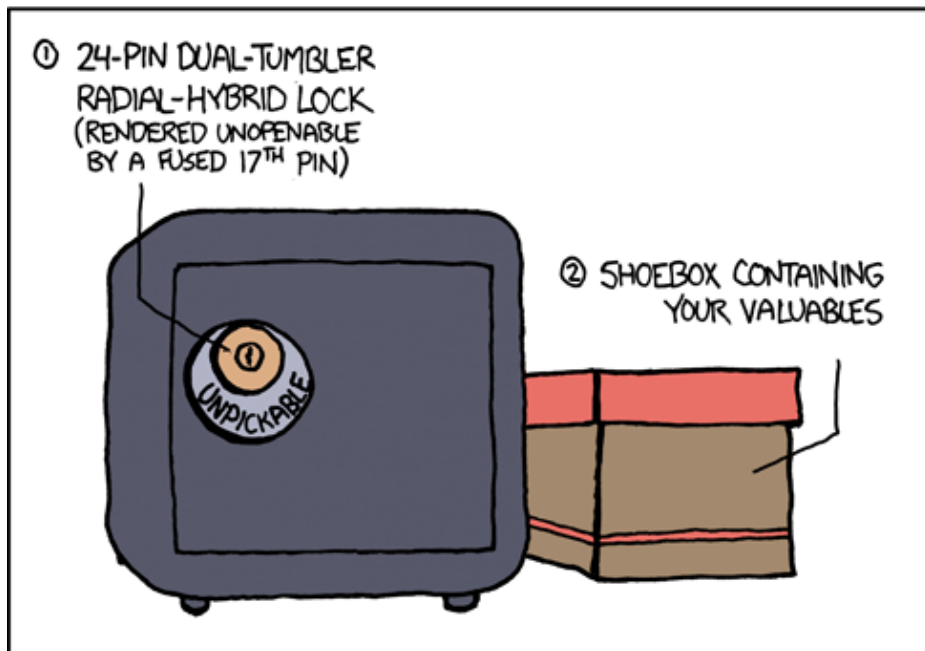
much difference (in 915 "Wine all tastes the same to me."; in 1534, "maybe we should just admit that all beer tastes kind of bad and everyone's just pretending?") and people just pretend due to social pressure.

The title text presents the same idea in a different wording. Our brains scale the quality of all things the same way, with a subjective impression of the difference between best and worst largely the same, regardless of what is being evaluated. Things with a narrow dynamic range, like the Wikipedia signatures or pictures of Biden mentioned the comic, have their negligible differences in quality expanded so that the best are as good as the best of anything, and inversely for the worst.

## #916: Unpickable

*June 24, 2011*

# HACKER SHIELD GEEK-PROOF SAFE SYSTEM:



The safe is empty except for an unsolved 5x5 Rubik's cube.

## Explanation

The comic plays on the idea that geeks and nerds will try to break into high-security areas in order to challenge themselves, instead of to steal things. The vault is labeled "unpickable" as a kind of challenge to break into it, while all the valuables are simply stored in a shoe box beside the vault.

A 24-pin dual-tumbler radial-hybrid lock would probably be too bulky and cumbersome to actually exist. The key would be huge, or just plain long. Given the length of the key, it would need to be extremely strong, and the length would be around 96mm, assuming that each notch is 5mm. In theory, though, it would be a remarkably difficult type of lock to pick. The fused 17th pin means that, even with the correct key, it cannot be opened. It would be much easier to simply break open the safe with brute force than to pick it. A simple and nerdy way to open the vault with brute force would be to use canned air, using the principle that cold objects are more brittle. Once the air is emptied onto the lock, it can be easily smashed with an ordinary hammer. This is an example of nerd sniping, since the vault is nearly unopenable, nerds and geeks would spend all their time on the vault and ignore the seemingly useless shoe box.

The title text continues the theme, with an unsolved 5x5x5 Rubik's cube to further challenge and distract the thief.

## #917: Hofstadter

June 27, 2011



"This is the reference implementation of the self-referential joke."

## Explanation

Douglas Hofstadter is an American author who has written several books about philosophy, mathematics, and science. He is perhaps most famous for his book *Gödel, Escher, Bach* which explores "strange loops," or self-referential systems. "Meta-" is a Greek prefix meaning "outside" or "beyond." As an adjective, "meta" informally refers to anything self-referential, like the last phrase of this sentence. An example of the use of such a term can be found in 1313: *Regex Golf*.

At first reading, the six word autobiography in the second panel, "I'm So Meta, Even This Acronym", may seem unfinished, however the clue is in the final word. An acronym is an abbreviation formed by the initial letters of a series of words, and reading the first letter of each of the six words in order yields "ISMETA", completing the sentence and setting up the self-reference where it reads "I'm so meta, even this acronym IS META". Hofstadter himself did something similar in *Gödel, Escher, Bach* in the chapter "Contracrostipunctus", where the first letter of each line spells out the phrase "Hofstadter's Contracrostipunctus Acrostically Backwards Spells J.S.Bach" - and taking the first letters of each word in that sentence backwards does indeed spell "J.S. BACH".

This comic is probably a reference to *Six-Word Memoirs*, a project launched in 2006 in which people "tell their life story in just six-words".

This comic may additionally be a reference to the meme "explain <whatever> in six words", which was making the rounds at the time.

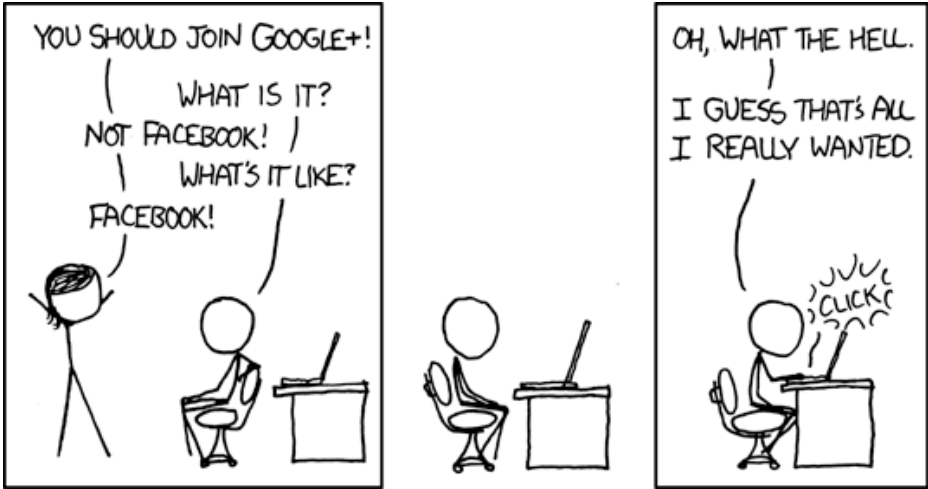
In the title text, a reference implementation is, broadly, an example of how to implement some feature during the software development process. In this case the feature is a self-referential joke, and the sentence itself is, correctly, self-referential.

Hofstadter has been referenced before, in the title text of 555: Two Mirrors and 608: Form. Furthermore, his famous book has been directly spoofed in the title of 24: Godel, Escher, Kurt Halsey. Finally, the self-reference reference ("IS META") is also a typical concept used most famously in 688: Self-Description but also in several other comics.



## #918: Google+

June 29, 2011



On one hand, you'll never be able to convince your parents to switch. On the other hand, you'll never be able to convince your parents to switch!

## Explanation

At the time of the comic's release, Google+ was a new social network announced by Google on June 28, 2011. When it launched there were many tech articles written about G+, which appears to look and/or function similarly to Facebook. In the first panel, Megan describes G+ as 'not Facebook'. Facebook is a popular social networking site.[citation needed] She then describes G+ as being like Facebook.

After Cueball thinks about it in the second frame, he comes to a realization in the third frame that a social network like Facebook, but not related to Facebook is all he really wanted. This is in reference to the backlash that happens every so often wherein people grow tired of Facebook, its arcane policies, its cavalier attitude toward user privacy and/or its general disdain for end users, and people want to leave Facebook, but have no comparable platform to move their social networking to.

The title text uses "you'll never be able to convince your parents to switch" as both point and counterpoint in an argument, since this fact has both negative (your parents won't see posts you want them to see, and won't be able to post things for you to see) and positive (your parents won't see posts you don't want them to see, and you won't have to worry about keeping up with their posts) implications.

On April 2, 2019, Google shut down Google+ for

consumers. It is still available for users with a Google Workspace account.

## #919: Tween Bromance

July 01, 2011



Verbiage. Va-jay-jay. Irregardless.

## Explanation

Apparently, Randall hates some ridiculous neologisms. Cueball seems to be dictating a "Tween bromance" story or novel to Megan, who is possibly typing it up. He is including all the words that get to Megan in a sequence. Megan is just annoyed and starts to shriek in rage and annoyance; considering Cueball keeps speaking more annoying words in the title text, that seems to have been the point.

- "Tween" means a pre-adolescent. Portmanteau of teen and between, specifically above the age of 9 (the last value not in the tens) and below the age of 13 (the first actual "-teen" number).
- "Bromance" means a close non-sexual friendship between two males. Portmanteau of brother and romance.
- "Guesstimate" means an estimate made with very little information. Portmanteau of guess and estimate.
- "Frenemy" means a friend who is also a rival. Portmanteau of friend and enemy.
- "Yiff" is a word invented by the furry community. In most contexts it simply means "copulate", supposedly derived from the sound a fox makes during mating, and can refer to any form of sexual activity, including cybersex.
- "moist" is an ordinary word, but one that many people find mildly creepy, especially in this context.

- "Taint" is the part between the genitals and the anus (the perineum) in slang.
- "Panties" is a common term in the U.S. for women's underwear.
- "Preggers" a slang term for being pregnant.
- "verbiage" is a fairly new usage of an older word, meaning too many words used to explain a subject.
- "Va-jay-jay" /və'jājā/ IPA /və'dʒeɪdʒeɪ/ is a way of saying "vagina".
- "Irregardless" is a solecism. Or perhaps this portmanteau.

So, the full sentence roughly translates to: By my rough guess, my friend-slash-rival engaged in sexual activity so intensely that her wet perineum caused her underwear to become pregnant.

This is probably nonsensical, as clothing cannot bear children.[citation needed] It may also reflect Cueball's intentional parody of writers who lack understanding of anatomy/basic reasoning. However, at a stretch, the word "preggers" could be interpreted to refer to the rare, literal meaning of pregnant: full/filled. By this logic, "her moist taint made her panties preggers" would simply be an unusual way to say "her underwear were filled up with liquid". But in that case: ew.

Like this comic fills a sentence with (gross) neologisms, 550: Density crams a sentence with memes.

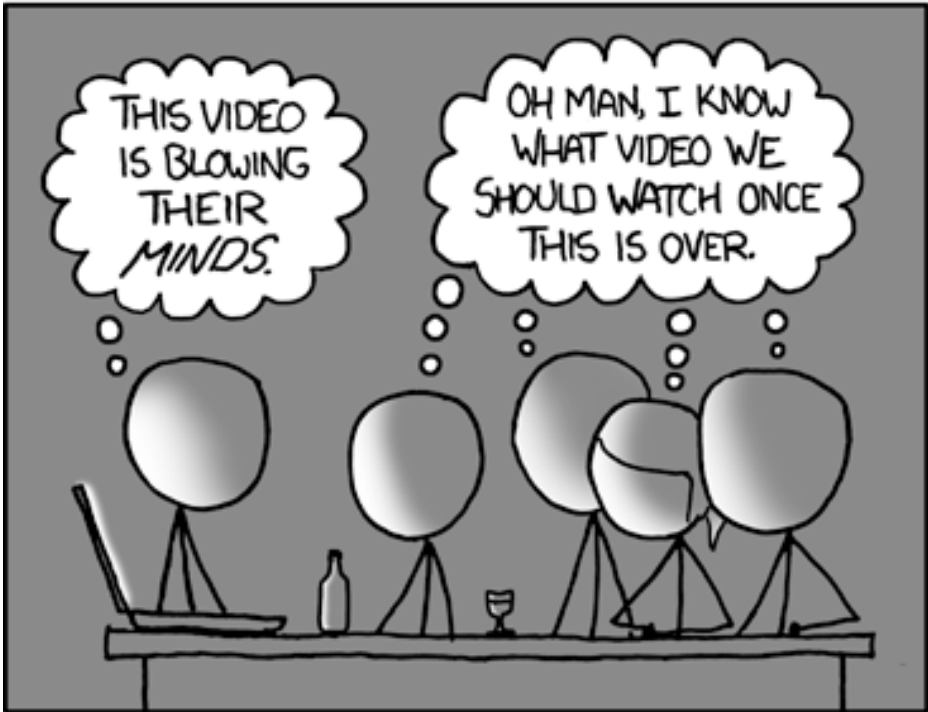
According to 1485: Friendship, Randall doesn't like the

word bromance much either. Uncomfortable synonyms are also seen in 1322: Winter and 2352: Synonym Date.

## #920: YouTube Parties

July 04, 2011

### THE PROBLEM WITH YOUTUBE PARTIES:



This reminds me of that video where ... no? How have you not seen that? Oh man, let me find it. No, it's ok, we can go back to your video later.



## Explanation

A YouTube party is when a group of people show each other YouTube videos. The problem with YouTube parties is that no one pays attention to the video that's playing; instead, each person is thinking of the video that they personally want to play next.

You can see analogous behavior at any get-together where couples (parents) are telling stories about their kids. Nobody cares about anybody else's kid; they are just waiting (not even listening) until they get the chance to talk about their own offspring.

The joke seems to be that everybody is doing this, but it is unclear whether they realize it. They each seem to be under the delusion that the others will be fascinated by "their" video (or child's accomplishments), even though the evidence strongly suggests otherwise. Possibly they don't care about that either; they just want an audience, even an unwilling one.

This may be defensible where kids are involved, because the parents could reasonably feel that the accomplishments of their children reflect well on themselves. However, the people in the YouTube party didn't create the videos, they just found them. Which makes their behavior (or perhaps YouTube parties in general) even more inane and pointless.

The title text reiterates this point. The speaker is

reminded of another video that is so superior to the one currently playing that we should find it and watch it immediately. We can always go back to the current video later (if anybody still remembers, that is; and according to the comic above no one will want to remember it).

## #921: Delivery Notification

July 06, 2011



You can arrange a pickup of your sword in Rivendell between the hours of noon and 7:00 PM.

## Explanation

In the US, when the package delivery company UPS (or other package delivery companies) knocks on your door or rings your doorbell and cannot reach you, they leave a delivery attempt notification stuck to your door. These may be for packages that require a signature, such as expensive electronics. An example is shown in the first panel.

This comic hints that the threshold for the UPS delivery person to leave such a notice is unreasonably low. The delivery personnel made only a token effort to deliver the package (which, incidentally, is their only actual job) before posting the yellow delivery notification and unconcernedly driving away to their next delivery (or, more likely, their next yellow-delivery-notification-posting).

After missing the delivery, Cueball (who is directly referencing *The Lord of the Rings*) asks the Elves to reforge his sword in order to go on a quest to retrieve his new laptop. In *The Lord of the Rings*, Aragorn (accepting his role as the heir to the king of the West) had the sword of Elendil, called Narsil, reforged (which symbolizes the reuniting of the race of man under one leader). Cueball obviously views the UPS building as a dangerous and impenetrable fortress, and possession of such a sword is the only way to guarantee success in his quest.

Ironically, when the Elves come to deliver the new sword, the delivery elf is unable to notify anyone in the house, and simply leaves another delivery notification.

In the title text, Rivendell is one of the home of the Elves, where the broken shards of Narsil resided, with Elrond and his elves. Unfortunately for Cueball, the sorting depot of Rivendell has the same, limited opening hours as the UPS. It is apparent that Cueball will not be getting his laptop in time for his flight.

## #922: Fight Club

July 08, 2011



THE FIRST RULE OF TALKING TO ME ABOUT MOVIES IS DO NOT TALK ABOUT FIGHT CLUB.

I'm not saying it's all bad, but that movie has not aged as well as my teenage self in 2000 was confident it would.

## Explanation

Fight Club is a movie starring Brad Pitt and Edward Norton that was released in 1999, based on the novel of the same name by Chuck Palahniuk. It included this oft-quoted and parodied line: "The first rule of Fight Club is you do not talk about Fight Club." Randall twists this iconic line by asking that if you ever meet him in real life, "Do not talk about the movie Fight Club."

The movie has been fiercely debated by critics, primarily regarding whether it makes a sophisticated philosophical statement about society and consumerism or whether it is just a movie with lots of fighting and mischief. It has a large and devoted fanbase who are convinced that the film is brilliant and transformative, and who have a reputation for wanting to discuss it at every opportunity.

In the title text, Randall explains his position further. He evidently saw it as a teenager and was implied to be a big fan initially, but now doesn't feel that it's aged well. As an adult, he doesn't claim the film is all bad, but has lost his enthusiasm for it, and appears to have no interest to discuss it with people who are still fans.

"This conversation is over" is also a line from the movie, used to bluntly cut off any further discussion. Cueball ironically uses a quote from the movie to make it clear he has no interest in discussing the movie.

## #923: Strunk and White

July 11, 2011

DEAR INTERNET,

WE, THE CURRENT EDITORS OF  
STRUNK & WHITE'S *THE ELEMENTS OF  
STYLE*, MUST—WITH GREAT RELUCTANCE—  
CLARIFY A POINT OF ORTHOGRAPHY:

"STRUNK & WHITE" SHOULD BE  
USED FOR THE STYLE MANUAL AND  
"STRUNK/WHITE" FOR THE EROTIC  
FAN FICTION PAIRING.



The best thing about Strunk/White fanfiction is that it's virtually guaranteed to be well written.



## Explanation

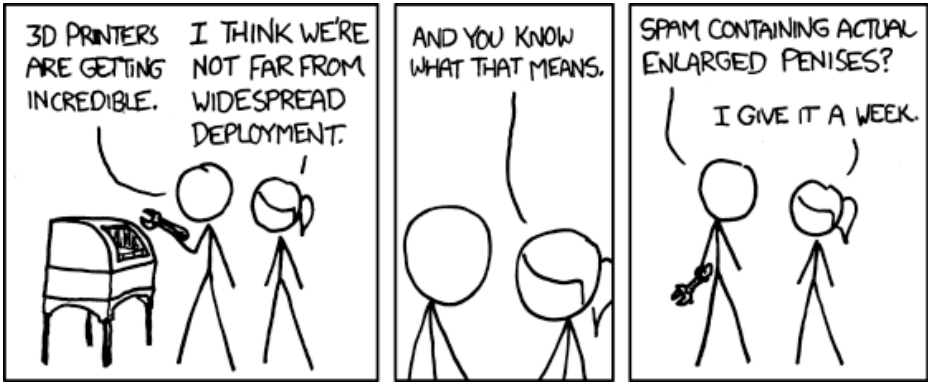
The 1918 writing style guide *The Elements of Style*, by Cornell University professor William Strunk Jr. and New Yorker writer E.B. White (perhaps better known as the author of *Charlotte's Web* and *Stuart Little*), is commonly referred to as "Strunk & White". In this comic, the current editors of *Strunk & White* are clarifying a matter of style pertaining to the style guide, an instance of meta humor, a recurring theme in *xkcd*.

Erotic fan fiction is a genre of writing in which fans make up erotic stories involving characters from non-erotic stories. "Slash fiction" is a subgenre that pairs characters of the same sex: These pairings are denoted by using the "/" to separate the paired characters, hence the name "slash fiction". This convention is generally thought to originate with the Kirk/Spock pairing in *Star Trek* fan fiction, wherein "K/S" was used for such romantic or erotic works of fan fiction, while "K&S" was used for non-romantic works. This comic imagines a similar distinction being necessary for "Strunk & White" vs. "Strunk/White".

The title text comments that authors of Strunk/White fan fiction will most likely have read *The Elements of Style*, which makes them better writers.

## #924: 3D Printer

July 13, 2011



I just can't wait for the Better Homes and Gardens list of helpful tips for household reuse of sixteen-inch acrylonitrile-butadiene-styrene phalluses.

## Explanation

With the ongoing development of 3D printing technology, the cost of low end 3D printers continues to reduce steadily, and the complexity of modelling and producing components is becoming easier. These factors, among others, means that 3D printers are beginning to be found in homes, rather than exclusively in businesses. Ponytail & Cueball are discussing the improvements and expect widespread deployment soon.

Spam emails promoting penis-enlargement products are very common, and often show images of unnaturally large penises to advertise how effective they are. The adverts prevalence and aggressive marketing techniques have made them a well known staple of email inboxes, though the improvement of spam filters has increasingly banished them to the spam folder.

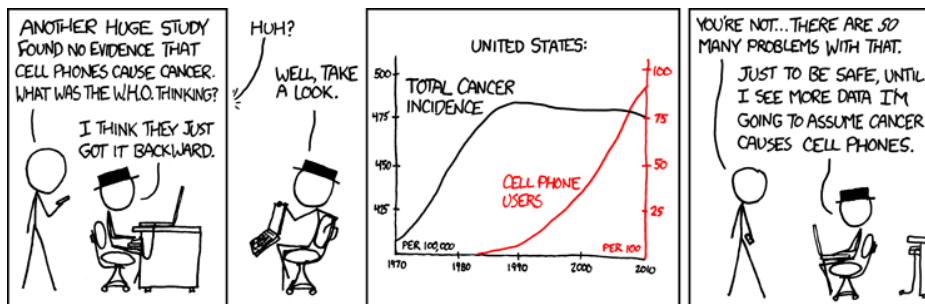
Cueball and Ponytail predict that the spam producers will quickly jump on the opportunity presented by the widespread prevalence of 3D printers, and start advertising their wares with 3D printed phalluses. Usually someone would have to proactively choose to print out a spam email, but it wouldn't be difficult to imagine a scenario where the email contains malicious code which automatically prints them a huge phallus.

In the title text, *Better Homes and Gardens* is an American magazine that, as the name suggests, shows you how to make your home and garden better often by

reusing common household items in new and innovative ways. Acrylonitrile-butadiene-styrene (or ABS) is a light-weight and moldable plastic which makes it perfect for 3D printers.

## #925: Cell Phones

July 15, 2011



He holds the laptop like that on purpose, to make you cringe.

## Explanation

This comic is a good explanation of the correlation/causation fallacy, where one party states two unrelated events and posits that they must have influenced each other.

After hearing about the "Cell Phones Don't Cause Cancer" study, which refutes a claim made by the World Health Organization (just Google the debate or check out Wikipedia's article on it, the comic doesn't focus much on it), Black Hat plots "Total Cancer Incidence" per 100,000 and "Cell Phone Users" per 100 on the same graph. The graph in frame 3 shows an exponential rise in cancer in the 70's and 80's, followed by an exponential rise in cell phone usage in the 2000's. Black Hat reverses the correlation/causation fallacy, and comically comes to the conclusion that cancer causes cell phones.

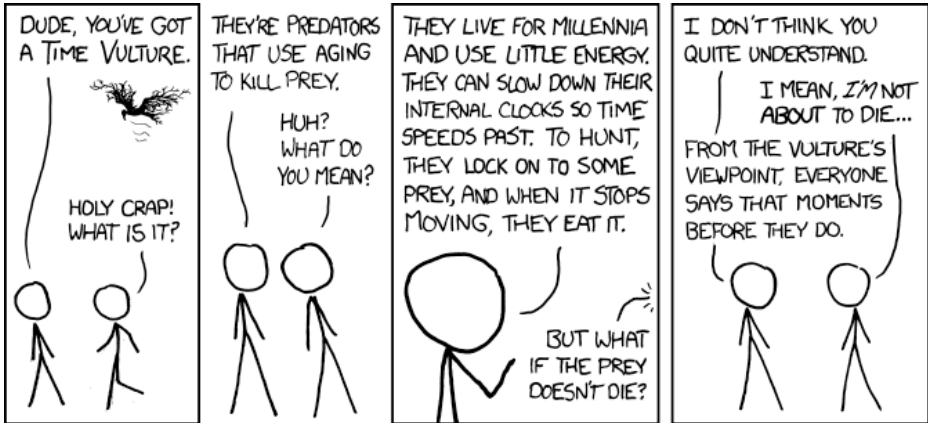
The comic highlights a well-known fallacy known as post hoc ergo propter hoc, often shortened to simply post hoc. The Latin translates to "after this, therefore because of this," (the simpler "after this" therefor implies "because of this"; post hoc, as it were!) referring to the common mistake that because two events happen in chronological order, the former event must have caused the latter event. The fallacy is often the root cause of many superstitions (e.g., a person noticing they wore a special bracelet before getting a good test score thinking the bracelet was the source of their good fortune), but it often crosses into more serious areas of thinking. In this

case, the scientific research community, which often prides itself on its intellectual aptitude, is gently mocked for being nonetheless prone to such poor reasoning all too often. The different possibilities are generally known as causation, when one thing is proven to cause another, or correlation, when changes in one thing are aligned with changes in another, but there is no proof that they are directly related.

The title text refers to the way Black Hat holds the laptop in panel 2. Being that Cueball (and Randall, for that matter) are quite into computers, the potential damage to a laptop screen either from the weight of its lower body or the pressure of the user's fingers on the LCD screen is enough to make him squirm in discomfort. The risk of dropping the computer is also present. Both the fallacy and the way Black Hat is holding his laptop contribute to the "problems" that Cueball mentions.

## #926: Time Vulture

July 18, 2011



In a way, all vultures are Time Vultures; some just have more patience than others.



## Explanation

This comic is about the time vulture (hence the title), a fictional creature[citation needed] made up by Randall. Cueball notices that his Cueball-like friend is followed by a time vulture, making the exclamation Dude, you've got a time vulture.

The primary food source for vultures is carrion, or rotting meat. A time vulture, as explained by Cueball, is a type of vulture that can live for millennia (i.e. thousands of years), spending very little energy and it can even slow down its internal clocks so time speeds past, a kind of forward time travel, to the point where its prey dies. In this way, it can thus always wait long enough for the prey to die of natural causes no matter how long it takes, as seen from the prey's point of view. So in principle they kill their prey by using aging, as Cueball explains, although in fact, like any vulture, they just find prey that has already (almost) died, as from their point of view every living thing is just about to die. But as with other vultures, they do not participate in the actual killing. Time vultures thus just need to locate and find any one living creature (of a reasonable size), then it becomes its prey as it then just waits until it dies, spending hardly any energy while it waits. Real soaring vultures can also stay afloat for considerable time spans without actually using any energy as they just float on thermals.

Thus the time vulture will now keep soaring over Cueball's friends head for the rest of his life, and then

when he dies (whenever and of whichever cause), it will descend and feast on his carcass. This should, in principle, not make any difference to the friend, since most people already live with the knowledge that they will eventually die, and that their body will end up being destroyed one way or another.

And because the time vulture can slow down its internal clock, in its point of view, everyone who ever says "But, I'm not about to die" (or anything else, really), would say so right before they die. In humans' point of view, it could be many years after the statement was made, but for the time vulture, a human lifespan only lasts a mere moment.

It is thus really more of a philosophical comic about the fact that we all have death waiting for us, you could say it soars above our head and just wait for it to happen. And in relation to the deep time of the geology of the Earth or the expansion of the universe, the time it takes for people to live their lives is hardly worth mentioning...

In the title text it is stated that all real life vultures are actually a kind of time vultures, as real life vultures also sometimes spot a dying animal, not quite dead yet, and then wait for this prey to die. But time vultures are able to wait for many years for their prey to die, whereas regular vultures do not have that kind of time, before they need to feed or land, thus the comment that some vultures have more patience than others.

Real vultures and their preying habits were referenced in

1746: Making Friends, directly in the title text.

## #927: Standards

July 20, 2011

### HOW STANDARDS PROLIFERATE:

(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



Fortunately, the charging one has been solved now that we've all standardized on mini-USB. Or is it micro-USB? Shit.

## Explanation

For any engineering task, there are numerous ways a given problem can be solved. The more complex the task, the more room for diversity. That's all well and good for a one-off problem, but if a design is meant to be iterated over time, or if an entire industry is solving that same problem, part reuse and interoperability become issues to deal with. Technical standards thus came to exist so that industries could avoid wasting resources reinventing the wheel, whilst offering their clients a certain amount of simplicity and compatibility between vendors.

But standards have issues of their own. They don't accommodate every use case, they might have restrictions or royalties attached, and people tend to be plagued by Not Invented Here syndrome. So competing standards have a tendency to arise to address different perceived needs. After a while, the market for competing standards gets messy and hard to follow, and integrating systems built around competing standards gets burdensome. As a result, someone eventually takes on the challenge of creating a universal standard that everyone can rally around.

This almost never works. In many cases, a new standard fails to displace the incumbent standards, eventually loses funding and support, and thus becomes a relic of history. In many other cases, it only penetrates far enough to survive, ironically making the situation messier. The latter situation often ends up becoming cyclical, with

new standards periodically rising and failing to gain traction.

Three examples are given at the top of the comic: AC chargers, character encoding and instant messaging.

- Power adapters are notorious for varying from device to device - partly to try to prevent dangerous voltage/current mismatches, but partly just because manufacturers all chose different adapter designs. In 2011, Mobile phone chargers had mostly converged on a common USB-based solution, but laptop charging remained still a long way out, despite the adoption of yet another standard, IEC 62700, and Apple mobile devices generally used proprietary Lightning connectors (However that is changing because of European law). Randall notes that there was additional complexity due to the fact that there were also competing USB types; thanks to the European Union's common external power supply specification, micro-USB then won the day. In August 2014, the USB Type-C specification was published and started to displace micro-USB; it gained ground among laptop manufacturers as well. From 2021 to 2022, the EU successfully legislated for its common use.
- Character encoding is, in theory, a solved problem - Unicode is a standard for character sets which currently includes over 135,000 characters. However, Unicode is not an encoding, just an abstract representation of the characters, and there are several implementations which encode Unicode "code points" into usable characters

(including the two most common, UTF-8 and UTF-16). Despite the success of UTF-8 Unicode, older encodings like Windows-1252 have stuck around, continuing to cause weird bugs in old software and websites to this day.

- Unlike the other examples, there has been little or no effort by instant messaging companies to make their services interoperable. There's more value to keeping IM as a closed platform so users are forced to use the company's software to access it. Some software, like the Trillian chat client, can connect to multiple different services, but there is essentially no way to, for example, send a Twitter message directly to a Skype user. ActivityPub is an example of a standard intended to be universal, so any software using it for instant messaging can be 'federated' with each other, but as the comic points out, all this has lead to is yet another competing standard.

The title text mentions mini-USB and micro-USB, which were different standards used in 2011. As of 2019 for most applications of small USB ports (especially for charging / connecting cell phones), mini USB has lost most of its relevance and micro USB is competing with USB-C, as well as some solutions only used by single companies (such as Apple). As of 2023, Apple has also switched entirely to USB-C after pressures from the European Union.

Not all standards are created equal. In the development of standards, private standards adopt a non-consensus

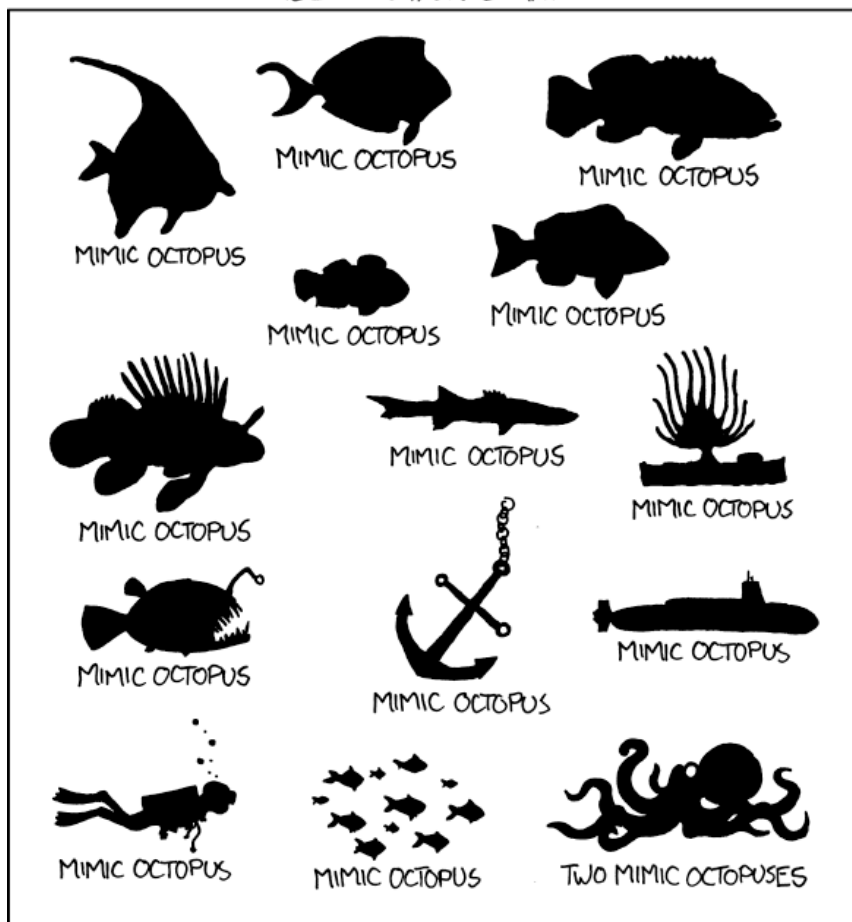
process in comparison to voluntary consensus standards. Private standards in the Information and Communications Technology (ICT) sector and the agri-food industry (governed by the Global Food Safety Initiative) are discussed in a publication from International Organization for Standardization.



## #928: Mimic Octopus

July 22, 2011

### SOUTHEAST ASIAN SEA LIFE IDENTIFICATION CHART



Even if the dictionaries are starting to give in, I refuse to accept 'octopi' as a word mainly because--I'm not making this up--there's a really satisfying climactic scene in the Orson Scott Card horror novel 'Lost Boys' which hinges on

it being an incorrect pluralization.

## Explanation

This comic is a parody of fish and sea-life identification charts, referencing the mimic octopus which, as the name implies, is able to mimic other animals, so all animals and objects found in the sea could actually just be such an animal (or animals).

The identification chart for South East Asian sea life shows 13 creatures mimicked including eight individual fish (two of which are not yet recognized) and other objects and animals. In order, top-to-bottom, left-to-right: A Moorish idol, unknown, a rockfish, a clownfish, unknown, a lionfish, a shark, a sea lily, an angler fish, an anchor, a submarine, a scuba diver and school of 11 fish. Finally there is an octopus, but rather than being the mimic octopus in its natural form it's actually two of them each (presumably) mimicking part of an octopus.

The Orson Scott Card novel that the title text refers to is *Lost Boys*: "A withdrawn eight-year-old in a troubled family invents imaginary friends who bear the names of missing children" (Publisher's Weekly). The part of the story that Randall is referring to (Chapter 7, Crickets) involves a situation where the protagonist, Stevie, is given a C grade for an otherwise impeccable diorama featuring underwater animals involving clay sculptures (when only a poster would have sufficed) and a well-written presentation supposedly because the other children had destroyed the diorama before the end of the day. To

make matters worse, his teacher, Ms. Jones, had made fun of his project and given the ribbon for first prize to someone else.

On inquiring about the grading, his father, Step, found out that the principal, Dr. Mariner, had already made the decision to hand Stevie the blue ribbon for first prize as she had reviewed the project before it had been destroyed, but Ms. Jones had secretly overruled her behind her back by announcing that another child (JJ) would receive the ribbon. So, the next day he met up with Ms Jones after school to have a word on the grading of his project. Needless to say, they ended up arguing about minor issues, with Mrs. Jones justifying the reason for her decision on, among other things, the definition of a 'depiction', whether or not the amount of content was defined by the word count or the number of pages and of the importance of putting the report in a plastic cover. The argument finally comes to a head when Step points out that there was only one red mark on the project report, and that concerned an 'incorrect' pluralization of the word 'octopus'

After proving his case that his son did indeed deserve an A grade, he then threatened to bring the matter to the attention of the principal. He then warned Mrs. Jones that while he wanted the grade to remain unchanged, he wanted her to inform the class that the ribbon would be awarded to Stevie, before revealing that he had been recording the conversation all along. And, after this, after Mrs. Jones came crying for forgiveness before leaving, Step realized how vulnerable she was and how she was

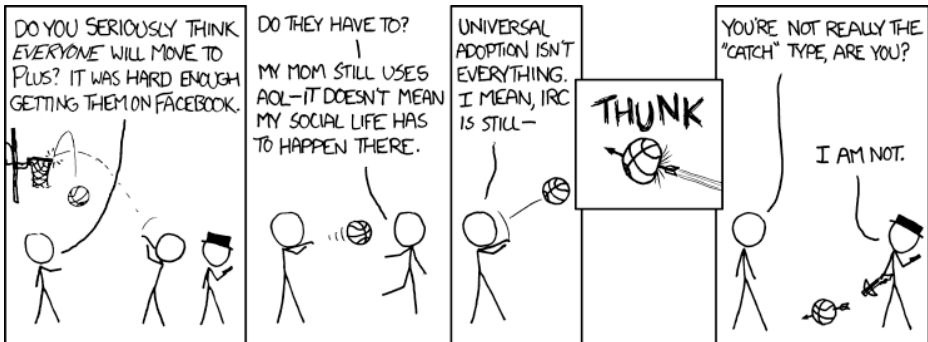
channeling her frustration at one particular student in each class to find some relief from that.

According to the Merriam-Webster Dictionary, 'octopi', 'octopuses', and 'octopodes' are all correct plural versions of "octopus." However, "octopi" is etymologically incorrect as "octopus" is of Greek origin, rather than Latin. Following the Greek, the correct plural is 'octopodes'. Supposedly, Randall would very much like the word 'octopi' to remain unrecognized by major dictionaries as otherwise it would lessen the magnitude of the climactic conclusion of this argument by rendering Step's mockery of Ms. Jones' perceived intellectual superiority factually invalid. This also offers another reason why the octopus in the chart is named two mimic octopuses, so Randall can use the correct pluralization of the word in the comic. This is an example of a comic where the title text seems more important to Randall than the actual comic.

It should be noted that, at least according to Etymology Dictionary, "octopi" is wrong for exactly the reasons that Step lists and first appears over 60 years later.

## #929: Speculation

July 25, 2011



'I was pretty good at skeet shooting, but was eventually kicked off the range for catching the clay pigeons in a net and dispatching them execution-style.'

## Explanation

During a basketball game, the players discuss the nature of universal conformity. Facebook and the now-defunct Google+ were competing social networks; at the time of this comic many people were switching to Plus over Facebook leading many to speculate that Facebook was in decline and that Plus would soon be the dominant social network. As of 2019, it seems that Facebook has successfully held its position as the Default Social Network™, while Google Plus was a colossal blunder for Google and was finally sunset for consumers in April 2019.

The two players seem to have a disagreement over this. One player states that it would be ridiculous to expect everyone to move to Plus. The other player denies the notion that they have to, stating that he values his personal preference over conformity. He supports this idea by saying that his mother still uses AOL and other people continue using IRC and that if each time a new dominant social network emerged and everyone switched to it, neither of these things would stick around.

They are interrupted when they pass the ball to Black Hat, who immediately shoots it with a crossbow bolt. Their arguments and rather intelligent discussion are derailed by the absurdity of Black Hat's reaction, which is both humorous and puts the issue in stark contrast.

Black Hat neither joins in the discussion nor does he participate in the game. It seems that any offer to

participate in either is met with a blunt and clear denial. He is simply not a conformist.

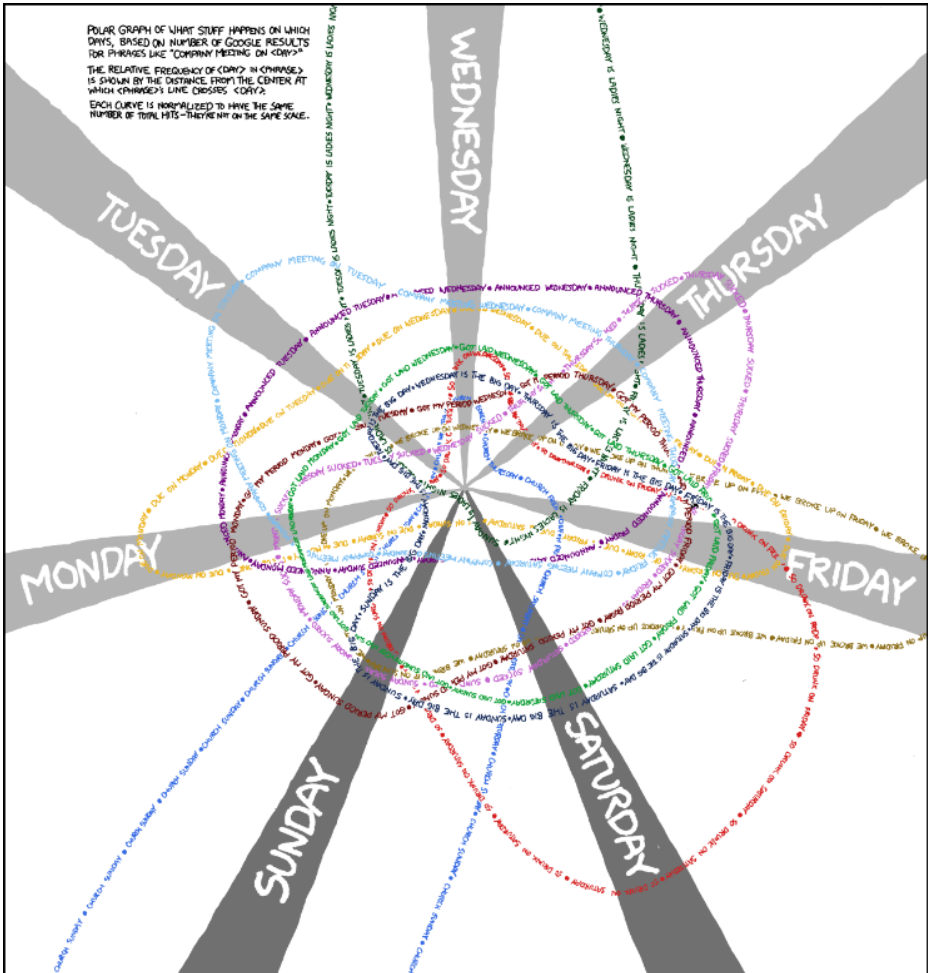
A possible explanation for the joke is that while tech geeks or Google enthusiasts might discuss whether the world will move from Facebook to Plus, a number of people might simply ignore the debate and "shoot" the discussion dead by just ignoring the existence of anything that isn't Facebook. Or even that of Facebook itself; Blackhat's attention appears to be on a phone, at least before and after having loosed the crossbow bolt, but there's no obvious clue here as to what he actually uses it for/with, at the time of this comic.

In the title text, Black Hat continues to provide an example of his tendency to play by his own rules. A clay pigeon is a clay disc that is thrown into the air and serves as a target on a skeet shooting range. Participants are expected to shoot the pigeons with a shotgun but Black Hat would rather capture the clay pigeons and shoot them from a very close range. (This is made even more humorous by the excellent crossbow skills he shows in the comic.) This practice eventually got him expelled from the shooting range. It is unclear whether Black Hat was good at shooting clay pigeons from farther away.



## #930: Days of the Week

July 27, 2011



Not pictured: the elongated Halley's-Comet-like orbit of every Rebecca Black lyric.

## Explanation

As explained in the image, the graph is a polar graph, charting the relative strengths by which certain phrases are associated with certain days of the week. The closer a phrase comes to the center of the graph, the less the phrase is associated with whatever day of the week that is. Conversely, the further out a phrase is, the more associated with that day of the week it is.

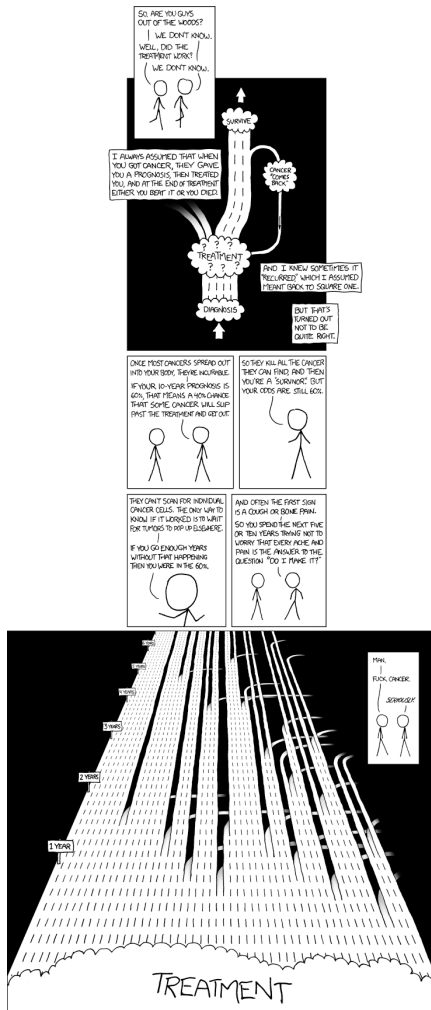
Perhaps the clearest example of this in the above graph is the ladies night line, which has such a strong peak on Wednesday that it goes clear out of the bounds of the picture. Likewise, church is so strongly associated with Sunday that it goes off the chart there.

Also of interest are the less eccentric orbits, for instance "big day" and "so drunk." The fact that these don't clearly peak on any one day indicates that (according to Google, at least) big days are spread out fairly evenly throughout the week (with a minimum on Mondays), and so drunk tends to peak on weekends, though it seems fairly evenly split between Fridays and Saturdays.

Mentioned in the title text is Rebecca Black's viral pop hit, Friday, which received considerable negative attention and ridicule for its terrible songwriting and performance. It peaks so far out that no perspective which would show it would be of any use, since many parodies have been made of the song since.

## #931: Lanes

July 29, 2011



Each quarter of the lanes from left to right correspond loosely to breast cancer stages one through four (at diagnosis).

## Explanation

The comic is built around a dialogue between two people (we'll say Cueball is the one talking, and the other is his friend) about cancer, presumably cancer that Megan has been diagnosed with. The conversation itself is about as straightforward as a conversation can be. It details the maturation of Cueball's and Megan's understanding of cancer diagnoses, knowledge which we can presume he has gained, reluctantly, by watching a loved one suffer.

This whole cancer series was sparked because Randall's then-fiancee, now wife, is currently in Megan's position, and we, the readers, are now the beneficiaries of this new understanding of cancer diagnoses without having to watch somebody close to us suffer.

The comic's title, Lanes, comes from the two panels which illustrate both ends of the spectrum of Cueball's mental representation of how cancer treatment proceeds. In that there are many possible outcomes for cancer treatment, the image of a multi-lane freeway seems an apt metaphor to represent this understanding visually.

In the first freeway diagram, there are several paths, but the system is very simple, and easy to take in. Only a few lanes lead off into the oblivion which surrounds the freeway, a single off-ramp circles back from the path to survival to treatment, and survival is a visible endpoint.

In the second freeway diagram, however, things are

much, much more complex, and much more bleak. Even six years out, survival isn't visible, and many lanes end in oblivion, sometimes not veering off for years after treatment. The title text informs us that this is meant to be loosely representative of breast cancer stages one through four, proceeding by quarters from left to right.

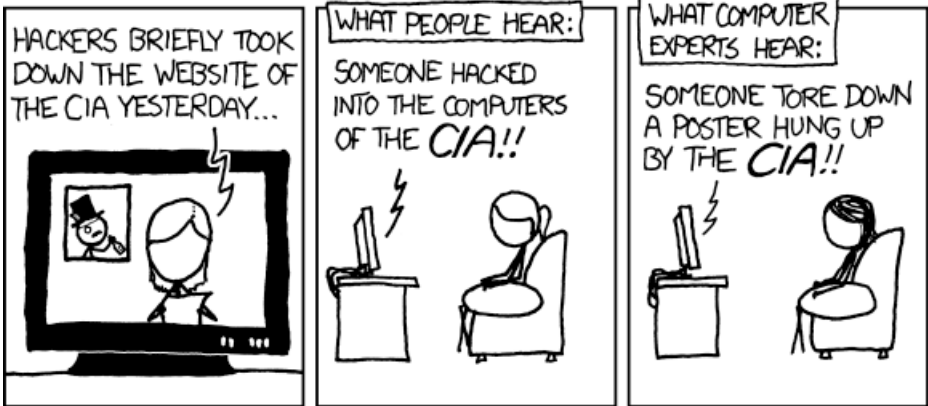
This reality is deeply troubling, because it means that it's impossible to ever be sure that a cancer treatment has worked. So cancer patients (and their loved ones), can only go through the treatments, and spend the rest of their lives hoping that it was successful, and constantly being checked to see if the cancer has returned. Even if the best case, they can never feel entirely safe from it. It's a grim outlook, hence the friend's understated but completely fitting reaction to this plethora of new knowledge.

Specific numbers:

The opening line of "being in the woods" is revisited in 1928: Seven Years, where Cueball and Megan are shown walking through a forest in a cancer-themed strip.

## #932: CIA

August 01, 2011



It was their main recruiting poster, hung nearly ten feet up a wall! This means the hackers have **LADDER** technology! Are we headed for a future where everyone has to pay **\$50** for one of those locked plexiglass poster covers? More after the break ...

## Explanation

Blondie as a news anchor is reporting on a cyberattack on the CIA (hence the title).

This comic is a reference to the attacks by a group briefly known as LulzSec, which was a splinter group from the internet community known as Anonymous, also featured in 834: Wikileaks. In the back of the news report in frame one is the logo that was used by LulzSec. The group was able to publicize several high profile attacks. They were able to briefly take down the CIA website using a DDoS attack. DDoS stands for Distributed Denial of Service in which the attacker uses many computers to send traffic to a host and render it incapable of answering requests from any other computer, effectively taking the site down.

This comic is pointing out the difference between what lay-people (Ponytail) and the computer expert (Megan) hear when seeing a story like this. Most people may think there is no boundary between the CIA website and its internal network, and conclude hackers compromised the USA intelligence service's most precious data, which would be an incredible display of incompetence by the CIA and would have some pretty obvious negative side effects for CIA assets around the world.

Computer experts, on the other hand, may compare the CIA website to a company's poster, so the damage done is much different and less harmful: the CIA's public

relation capacities are hindered for a few hours. The damage from a DDoS is less a catastrophic compromise of valuable federal databases, and more like flash mob crowding in the lobby of the CIA offices, making life mildly inconvenient.

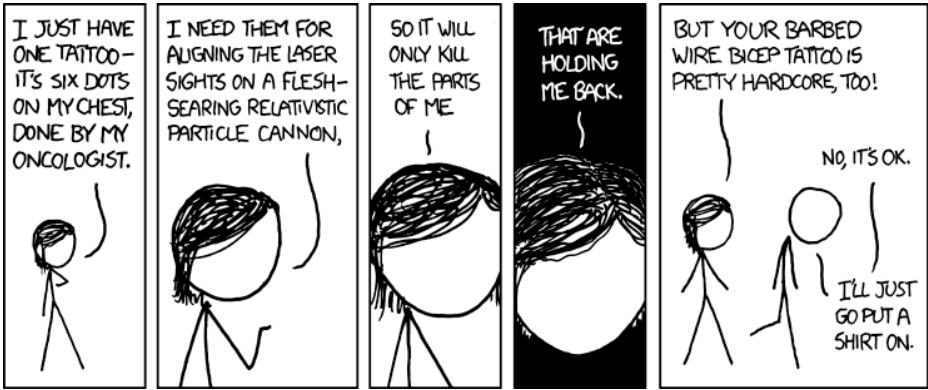
One particularly humorous and possibly unintended aspect of this is that "People" and "Computer experts" are listed separately, implying that computer experts are not people. Randall probably meant "lay-people" rather than people.

The title text is a transcript of a made up news report. A story similar to the attack is illustrated using old technology. This attempts to demonstrate how silly the news coverage of the real event is. The recruiting poster refers to the CIA website, as it is a PR tool with no connection to sensitive information. It being ten feet high refers to the fact that that the website is open to the public and has limited protections (as danger from a compromised site is low). The ladder technology refers to the DDoS attack, as these attacks are primitive, but possibly well coordinated. The plexiglass poster covers refer to website security tools that may be added to deter future vandalism.



## #933: Tattoo

August 03, 2011



I calculate that the electrons in radiation therapy hit you at 99.8% of the speed of light, and the beam used in a 90-second gamma ray therapy session could, if fired with less precision, kill a horse (they did not let me test this).

## Explanation

An oncologist is a doctor who specializes in the treatment of cancer. This comic is certainly related to Randall's wife's breast cancer. Megan in this comic has a tattoo for the alignment lasers of the radiotherapy machine which will fire a beam of radiation with sufficient intensity to kill the cells in the targeted area. A common such machine is a linear accelerator or "Linac" which accelerates electrons to very high speed, these can then either be used to generate high energy X-rays to treat the patient, or the electron beam itself can be used (both are types of radiation; the electrons being beta radiation and x-rays being EM [electromagnetic] radiation). Commonly when radiotherapy is used as part of breast cancer treatment some combination of both is prescribed. In order to allow healthy tissue to recover better, rather than deliver all the radiation in one go, the treatment is delivered a little bit each day over the course of about a month. It is therefore vital that the radiation can be delivered to the correct target area day after day, and this is done by lining up the alignment lasers of the linac with the skin markers - that is Megan's tattoo dots. It may not be considered a "traditional" tattoo (because she says it was done by her oncologist and not in a tattoo parlor).

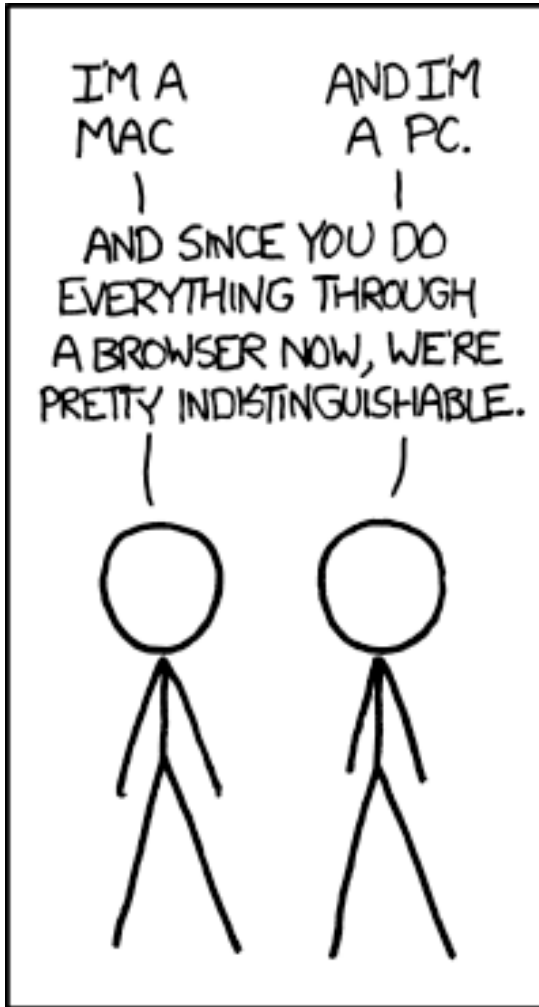
In the last frame, it is mentioned that Cueball has a barbed wire bicep tattoo, which is common in the US as a tattoo that people get when they want to seem tough, even if they aren't tough already.

The joke in the comic is that Cueball got this barbed wire tattoo to look tough, but it pales in comparison to the tattoo from (or for) the cancer removal or treatment. It is kind of funny because Cueball has his whole shirt off just to show a biceps tattoo.

The title text references gamma ray therapy after describing electron linear accelerator-based treatment systems; however, technically gamma ray therapy only refers to radionuclide (i.e., Cobalt-60) based radiation therapy systems. In regards to a 90-second session killing a horse, typical dose rates of modern radiation therapy systems are of the order of several gray per minute for the field sizes used, for example, in the treatment of breast cancer. It is feasible that a single 90-second delivery of radiation could deliver over 10 Gy in a single instance to the specific areas of the body that could be fatal, such as neuropathy or radiation induced liver disease.

## #934: Mac/PC

*August 05, 2011*



It's fun to watch browsers fumblingly recapitulate the history of window management. Someday we'll have xmonad as a Firefox extension.

## Explanation

This comic is a parody of the "Get a Mac" (also known as "I'm a Mac" or "Mac vs. PC") ad campaign for the Mac brand of computers. The ads personified the Mac and their competitors, the PC. The ads poked fun at the PC's terrible function while paying attention to the Mac's unique features. Each ad started with the duo introducing themselves as "I'm a Mac..." "...and I'm a PC."

The comic, however, presents the differences between them as no longer of much importance, since most everything nowadays is done through browsers. In essence, using the same browser to visit the same website among different operating systems would give you an experience that is very much the same. Additionally, there is some self-referential humor here; both the Mac and PC are Cueballs due to xkcd's style. Therefore, they are literally identical as far as appearance goes. The apotheosis of computing via a browser is probably the Chromebook, a range of laptops whose operating system is based upon the browser Google Chrome, and which first became commercially available a few weeks before this comic appeared.

The title text refers to window management, which is software that controls windows on computers, and is in many ways similar to the more recent development of tabbed browsers. xmonad is one such program, and Randall says that eventually it will be an extension usable

with the browser Firefox. What makes it somewhat unusual (and thus worth mentioning) is that it is a tiling window manager, meaning it automatically arranges and resizes newly opened program windows to fit a grid. This is especially useful on large screens.

## #935: Missed Connections

August 08, 2011

### PERSONALS > MISSED CONNECTIONS



YOU: CLINGING TO HOOD OF YOUR STOLEN WIENERMOBILE, TRYING TO REACH INTO ENGINE TO UNSTICK THROTTLE

ME: SCREAMING, DIVING OUT OF THE WAY

YOU: VAGUELY HUMAN SILHOUETTE

ME: AT BOTTOM OF WISHING WELL WITH HARPOON GUN

YOU: CONFUSED UDP PACKET

ME: CISCO ROUTER IN 45.170/16 BLOCK

YOU: BADDEST FUCKIN' JUGGALO AT VIOLENT J'S PARTY

ME: NANCY PELOSI (D-CA)

YOU: GETTING MARRIED TO ME

ME: ALSO GETTING MARRIED, BUT DISTRACTED BY MY PHONE

YOU: CUTE BOY ON CORNER OF 4TH & MAIN, 5'11, 169 LBS, SOCIAL SECURITY NUMBER 078-05-1120, POCKETS CONTAINED \$2.09 IN CHANGE, KEYS, AND A CONDOM. RETINAL SCAN ATTACHED

ME: DRIVING STREET VIEW VAN

YOU: GEORGE HERMAN "BABE" RUTH

ME: FELLOW TIME LORD SAW YOUR TARDIS ON THIRD MOON OF

The Street View van isn't going to find out anything Google won't already know from reading my email.

## Explanation

Missed Connections is a page on Craigslist in which people who saw each other briefly and want to reconnect attempt to find each other again. In the case of missed connections, one person describes themselves "Me" and describes the other person "You" in order that the second person would recognize themselves and try to reconnect.

The first entry appears to be a goofy joke, although there have been many Wienermobile incidents in the past.

The second entry refers to a person (you) looking down into a wishing well (presumably to throw in a coin to get a wish), but someone (me) is sitting down in the well with a harpoon looking up spotting the silhouette at the top of the well. This seems like a very weird thing to do, and the vaguely human shadow may be lucky to be alive, since the only reason the "you" should know about the "me" is if the me fired the harpoon (and missed). A person sitting in a well telling people stuff (as if it was the well speaking) was the pun in 568: Well 2. Oddly enough, this entry could possibly be a reference to this episode of *The Fairly OddParents*.

The third entry is a reference to networking. UDP stands for User Datagram Protocol. UDP packets don't use handshaking to verify they have contacted the correct host, so they can get lost or confused. The Cisco router location is a block of IP addresses that was unallocated at the time when this comic was published but has been



allocated to Latin America and Caribbean since then. Cisco is a company that makes networking equipment. This is a play on a missed connection for someone who was lost and asked for directions.

The fourth entry is a reference to two events in 2011 in which President Barack Obama invited rappers--among other people--to the White House. After each event, right-wing commentators blasted the event as a party unbecoming of the dignity of the White House. Nancy Pelosi is the Democratic Leader of the US House of Representatives. The acronym (D-CA) is a common notation for politicians which notates party (D for Democrat) and state (CA for California). Pelosi would have also been invited to these events, and the missed connections listing is a reference to what the commentators imagined the event would have been like. A "juggalo" is a term referring to a fan of the rap group Insane Clown Posse (which includes rapper Violent J), which is notorious for having a wild, misogynistic, and violent fanbase.

The fifth entry is a straightforward joke. One of the two people getting married was so distracted by their phone they have no clue where their spouse is now, or even who they are. Alternatively, it could be that the second party deserted the wedding because they were frustrated by their partner being distracted by their cell phone during the wedding, and the first partner is now hoping to convince them to return.

The sixth entry is a reference to how the Google Street

View car was not only recording photos of the street in 360 degrees, it was also collecting data from unencrypted Wi-Fi networks. The comic takes this to the next level, that the Google Street View van also scans what we have in our pockets and does a retinal scan. In this case, the social security number referenced is the most used SSN of all time. The retinal scan takes this even further, indicating that Google's cameras are collecting fine enough images to identify people by Retinal scan.

The entry gets a bit absurd when you realize with all this data, it should be trivial for the Google employee to ID and meet this young man, and would not need the Missed Connections page.

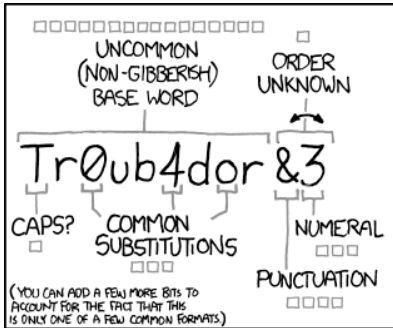
The last entry suggests that Babe Ruth, the American baseball slugger of 1914-1935, is actually a Time Lord. Time Lord is a reference to the popular sci-fi series Doctor Who in which The Doctor, who is a Time Lord, uses a TARDIS, which is a time travel machine. Possibly because he was a baseball player "ahead of his time". Alternatively, it may be a reference to the "Who's On First" radio sketch from the same time period. In this case, Babe Ruth would be the Doctor, or 'Doctor Who'.

The title text is another reference to the privacy concerns surrounding Google Street View van, to which Google responded by claiming that the street view camera wouldn't capture anything that someone walking by wouldn't be able to see. Randall is not worried about the street view van since he expects that Google will already know anything that such a van could discover from

reading his e-mails. This last statement is of course much more serious than having a photo taken by a passing van, thus making it clear what people should fuss about, and it is not the van.

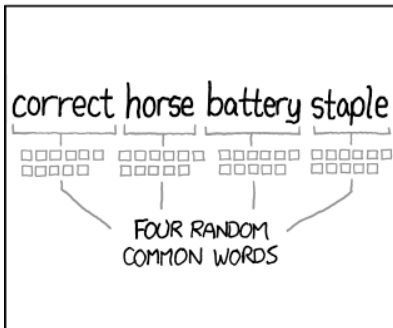
## #936: Password Strength

August 10, 2011



~28 BITS OF ENTROPY  
 $2^{28} = 3 \text{ DAYS AT } 1000 \text{ GUESSES/SEC}$   
(PLAUSIBLE ATTACK ON A WEAK REMOTE WEB SERVICE: YES, CRACKING A STOLEN HASH IS FASTER, BUT IT'S NOT WHAT THE AVERAGE USER SHOULD WORRY ABOUT.)  
DIFFICULTY TO GUESS: **EASY**

WAS IT TROMBONE? NO, TROUBADOR. AND ONE OF THE O's WAS A ZERO?  
AND THERE WAS SOME SYMBOL...  
DIFFICULTY TO REMEMBER: **HARD**



~44 BITS OF ENTROPY  
 $2^{44} = 550 \text{ YEARS AT } 1000 \text{ GUESSES/SEC}$   
DIFFICULTY TO GUESS: **HARD**

THAT'S A BATTERY STAPLE.  
CORRECT!  
DIFFICULTY TO REMEMBER: **YOU'VE ALREADY MEMORIZED IT**

THROUGH 20 YEARS OF EFFORT, WE'VE SUCCESSFULLY TRAINED EVERYONE TO USE PASSWORDS THAT ARE HARD FOR HUMANS TO REMEMBER, BUT EASY FOR COMPUTERS TO GUESS.

To anyone who understands information theory and security and is in an infuriating argument with someone who does not (possibly involving mixed case), I sincerely apologize.

## Explanation

This comic says that a password such as "Tr0ub4dor&3" is bad because it is easy for password cracking software and hard for humans to remember, leading to insecure practices like writing the password down on a post-it attached to the monitor. On the other hand, a password such as "correct horse battery staple" is hard for computers to guess due to having more entropy but quite easy for humans to remember.

Entropy is a measure of "uncertainty" in an outcome. In this context, it can be thought of as a value representing how unpredictable the next character of a password is. It is calculated as  $\log_2(a^b)$  where  $a$  is the number of allowed symbols and  $b$  is its length.

A truly random string of length 11 (not like "Tr0ub4dor&3", but more like "J4I/tyJ&Acy") has  $\log_2(94^{11}) = 72.1$  bits, with 94 being the total number of letters, numbers, and symbols one can choose. However the comic shows that "Tr0ub4dor&3" has only 28 bits of entropy. This is because the password follows a simple pattern of a dictionary word + a couple extra numbers or symbols, hence the entropy calculation is more appropriately expressed with  $\log_2(65000 \cdot 94 \cdot 94)$ , with 65000 representing a rough estimate of all dictionary words people are likely to choose. (For related info, see <https://what-if.xkcd.com/34/>).

Another way of selecting a password is to have 2048

"symbols" (common words) and select only 4 of those symbols.  $\log_2(2048^4) = 44$  bits, much better than 28. Using such symbols was again visited in one of the tips in 1820: Security Advice.

It is absolutely true that people make passwords hard to remember because they think they are "safer", and it is certainly true that length, all other things being equal, tends to make for very strong passwords and this can be confirmed by using [rumkin.com](http://rumkin.com)'s password strength checker. Even if the individual characters are all limited to [a-z], the exponent implied in "we added another lowercase character, so multiply by 26 again" tends to dominate the results. That's before using all symbols of ascii, html and unicode.

In addition to being easier to remember, long strings of lowercase characters are also easier to type on smartphones and soft keyboards.

xkcd's password generation scheme requires the user to have a list of 2048 common words ( $\log_2(2048) = 11$ ). For any attack we must assume that the attacker knows our password generation algorithm, but not the exact password. In this case the attacker knows the 2048 words, and knows that we selected 4 words, but not which words. The number of combinations of 4 words from this list of words is  $(211)^4 = 244$ , i.e. 44 bits. For comparison, the entropy offered by Diceware's 7776 word list is 13 bits per word. If the attacker doesn't know the algorithm used, and only knows that lowercase letters are selected, the "common words" password would take

even longer to crack than depicted. 25 random lowercase characters would have 117 bits of entropy, vs 44 bits for the common words list.

Below there is a detailed example which shows how different rules of complexity work to generate a password with supposed 44 bits of entropy. The examples of expected passwords were generated in random.org.(\*)

If  $n$  is the number of symbols and  $L$  is the length of the password, then  $L = 44 / \log_2(n)$ .

## #937: TornadoGuard

August 12, 2011



### THE PROBLEM WITH AVERAGING STAR RATINGS

The bug report was marked 'could not reproduce'.



## Explanation

This is a comic with a take on an application store - the most common app stores are for iPhones and Android devices. App stores take all the reviews and average the ratings for the overall star rating.

In this comic, we see why this is sometimes a bad idea, especially with something as important as an app called TornadoGuard that should alert the user if there is a tornado warning for an area, an announcement indicating that a tornado is approaching. In this case, there are three 5 star reviews about the stability and user interface features of the app, left by users who actually never experienced its core functionality (simply because they never used it in a place where there was a tornado since they got it); however, the only review related to whether the app really works is given the same weight as the others, and sadly for that user, the TornadoGuard app failed in alerting the user to an upcoming tornado. Tornadoes are a recurring subject on xkcd. Also see the future comics 1098: Star Ratings and 1754: Tornado Safety Tips.

In 2615: Welcome Back, Cueball returns to the app after almost 11 years to find that he has to walk through all kinds of info before getting to know if the visible tornado is likely to head his way...

The title text is software-developer humor, the same as used in 583: CNR which contains further explanation. It

is a note from the developer's bug report, which said they could not reproduce the error. Of course, they could only reproduce such a failure if there were a tornado coming towards their area, and if a tornado warning was issued. This is a fairly rare situation, especially in certain areas of the world. This lack of suitable testing conditions explains why the actual alert portion of their code appears to be faulty.

This is a common problem with code that cannot be easily tested -- that when finally needed, it does not actually work. This is the reason for emergency drills.

In 2219: Earthquake Early Warnings an app for warning of Earthquakes was the main topic, but tornado warnings was mentioned in the title text.

In 2236: Is it Christmas? being right most of the time, except when it matters was the topic.

## #938: T-Cells

August 15, 2011



'We're not sure how to wipe out the chimeral T-cells after they've destroyed the cancer. Though I do have this vial of smallpox ...'

## Explanation

This is a cancer- and leukemia-related comic. Two characters are having a discussion about a new trial (Porter et al. NEJM 2011) in cancer treatment. A trial is done to test a proposed treatment on a select group of patients before approval for the wider patient group.

In this case, the two characters are talking about a trial in which immune cells are taken out of the patient's body and genetically modified. The modified cells are able to both attack the cancer cells and replicate very quickly. However, to make these genetic changes inside the cells, they used HIV as the vehicle to introduce these new genes as it is specialized in invading and modifying immune cells. HIV is good for this because HIV attacks your T-cells and slowly kills off your immune system. If HIV was used as a vector to introduce a trait into your T-cells it could express a trait to hunt tumors and since it is already good at changing your T-cells it would be well-suited to this task.

Basically, this treatment seems to replace one terrible disease with another terrible disease. As the title text says, they don't know how to get rid of the modified T-cells after they remove the cancer. And the last part of the title text is a joke, in which the doctor suggests yet another disease, smallpox, to inject into the patient's body. This is similar to the song *There Was an Old Lady Who Swallowed a Fly* in which a little old lady who swallowed a fly where each time she puts some other animal in her

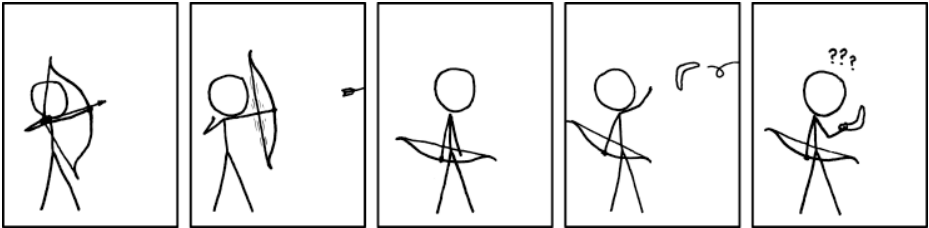
body to get rid of the last one and eventually she dies. This is akin to that as you have cancer so you put super-strong T-cells modified by HIV to get rid of them but then you have Leukocytosis so you get smallpox to kill those, and so on.

Cueball possibly could have guessed this because he is familiar with biology according to this comic and one of the most common diseases that attacks T-cells would be HIV.

Although highly expensive (because it currently requires customized set of alterations for each individual cancer), over the next few years subsequent clinical trials revealed the power of these super-strong T-cells (called Chimeric Antigen Receptor T-cells, or CAR T-cells for short) to cure previously incurable cancers. For example, in 75 children with previously untreatable leukemia, 4 in 5 had no detectable cancer three months after treatment with CAR T-cells (Maude et al. NEJM 2013). More and more different kinds of CAR T-cells are becoming FDA approved to treat a growing number of cancers. Seven years after this cartoon, the American Society of Clinical Oncology chose CAR T-cells as the 2018 Advance of the Year.

## #939: Arrow

*August 17, 2011*



'The Return of the Boomerang' would make a great movie title.

## Explanation

The comic appears to be a reference to 475: Further Boomerang Difficulties, which was a sequel to 445: I Am Not Good with Boomerangs, which had a man throwing a boomerang that never returned. Cueball shoots an arrow off with a bow and a boomerang returns to him. This confounds him. As it was also a Cueball that threw the boomerang in the other comic, this may be the same Cueball that now finally has his boomerang return to him after a long time (464 comics and nearly three years later). This would really freak him out then.

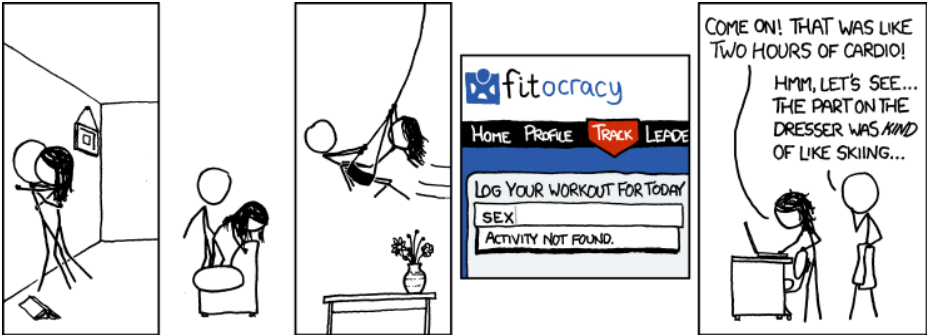
The title text is a pun on how boomerangs always come back, along with how "The Return of X" is often used for movie names.

However, as shown in the prequel as well as in an even earlier comic, Cueball/Randall has to admit: I Am Not Good with Boomerangs. So for him it would be a surprise if the boomerang returned!

Boomerangs also became a main theme in the interactive comic 1350: Lorenz.

## #940: Oversight

August 19, 2011



I felt so clever when I found a way to game the Fitocracy system by incorporating a set of easy but high-scoring activities into my regular schedule. Took me a bit to realize I'd been tricked into setting up a daily exercise routine.



## Explanation

Fitocracy is a web site that turns workouts into a social game by awarding points, badges, levels and all sorts of other gamification. Megan and Cueball, by their judgment, have spent approximately two hours engaged in sexual activity. However, according to this cartoon, Fitocracy does not consider sex to be an activity acceptable for its site, despite the vigorous nature of Cueball and Megan's sexual workout. This could be due to an oversight (an unintentional error), as the comic is titled, or intentional, as Fitocracy does not consider sex to be an acceptable exercise.

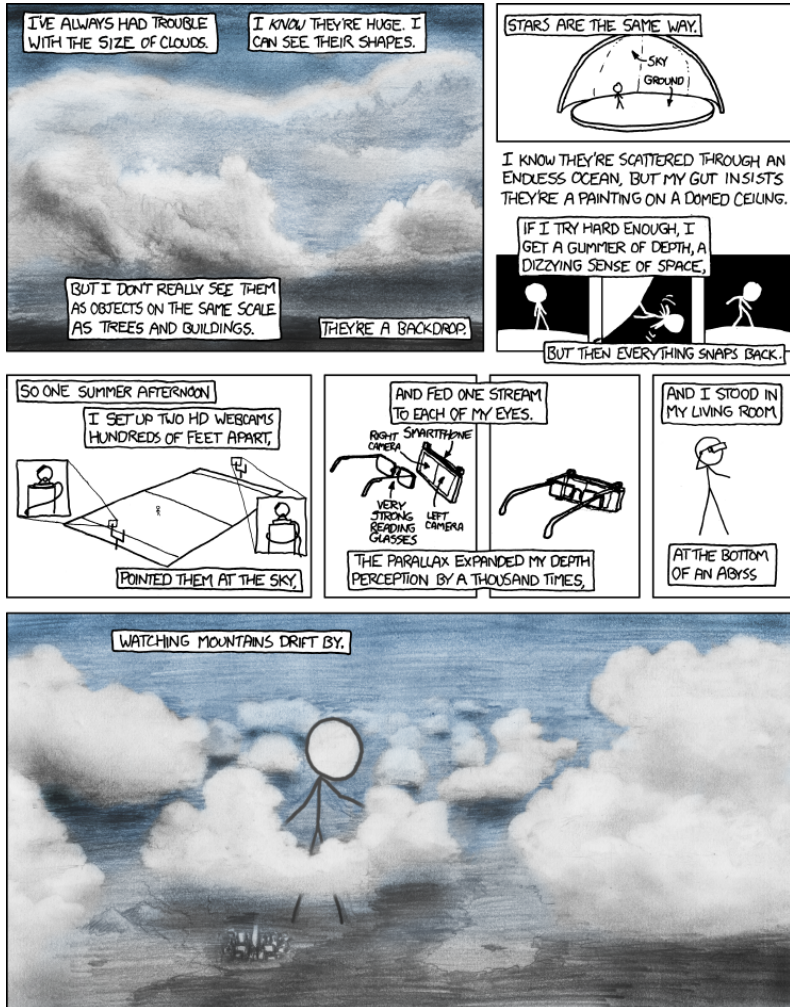
The title text explains how sites like Fitocracy are so successful. Because human brains, especially the cynical ones, like to game the system whenever they can, they will find easy things to do that also score high. In the case of Fitocracy, these are simple exercises that add up a lot when applied daily. But the creators of Fitocracy (and other such successful sites, like Weight Watchers or Lumosity) know this, and, as "in Soviet Russia", the system games you, as shown, to adopt an exercise regimen, or to lose weight, or to get smarter, or whatever else there is.

Sex does raise your breathing rate and heartbeat, but as sparkpeople (a similar site to fitocracy) notes, it is not as effective as a session at a gym, as it does not typically use the main muscle groups in their full range of motion and doesn't sustain a raised heartbeat for a sufficient length of

time. They consider sex to be less effective as cardio than brisk walking, as it burns only about 100-200 cal per hour, which is little raised above a typical resting rate of about 60 cal per hour. (Of course, these statistics exclude several of the sexual activities Megan and Cueball engage in.)

## #941: Depth Perception

August 22, 2011



I've looked at clouds from both sides now.

## Explanation

This comic is one of those that is less focused on humor and more focused on a sense of wonder at the world for both Cueball/Randall and the reader.

Cueball discusses how difficult it is to intuitively feel the reality of how vast the things he sees every day and night are - how big the clouds are, and how far away the stars are. Depth perception - seeing things in 3-D rather than as a flat 2-D image - is partly created by having "binocular vision", or two eyes spaced apart. Each eye sees a slightly different angle on a scene, and the brain combines these two views to give a genuinely three-dimensional view of something. 3-D glasses work the same way, by feeding a slightly offset image into each eye. When you look at far away objects, the offset from each eye is undetectable, and so they may look more like flat 2-D images - hence the impression Cueball has of stars being painted onto a dome rather than being extremely large, far away objects at very different distances.

He wonders if he can work around this impression as far as the clouds are concerned. Normally, Cueball's eyes are a few centimeters apart, like everyone else's, and his 3-D perspective is based on that scale. Here, Cueball puts HD webcams on the tops of football uprights, which are 360 feet (~110 m) apart instead of a few centimeters. He uses strong reading glasses to hold up a smartphone, and feeds the far more offset images of the webcam feeds to each eye so that his brain will create a 3-D perspective of the

clouds, which would normally be too massive for the offset between two human eyes to grasp their three-dimensional structure in the same way as smaller, closer things.

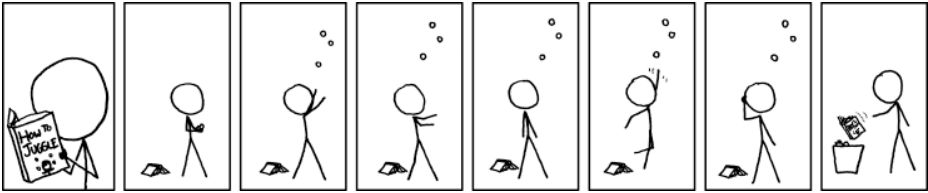
This technique doesn't give him the view as if he were a giant as in the final panel, but rather as if he were a giant "at the bottom of an abyss" as per the second-last panel, as the clouds are higher than the goalposts on which the cameras are mounted. The final panel is some artistic license to give the reader a real sense of what it feels like for Cueball to carry this out; it shows us that he has finally achieved a more truthful perspective on the size and shapes of the clouds than he had when he started.

The reason for the reversal of the "right camera" and "left camera" panes on the smartphone screen is unclear, this is likely just a mistake.

The title text is a line from the 1969 song "Both Sides Now" by Joni Mitchell; the full chorus runs: "I've looked at clouds from both sides now / From up and down and still somehow / It's cloud illusions I recall / I really don't know clouds at all." Binocular depth perception involves seeing the same object from slightly different angles, from 'both sides', so Randall is taking the song lyric and literalizing it. The song itself has a bittersweet tone and relates to how you understand things differently as you mature, but still don't necessarily feel like you understand them at all, so the tone also fits pretty unironically into the theme of the comic.

## #942: Juggling

*August 24, 2011*



Later: 'Why is there a book hovering over the trash can?'

## Explanation

In an attempt to learn to juggle Cueball begins practicing after reading an instruction book. In the third panel, it seems as though he is juggling normally after tossing the balls into the air. However, in a baffling phenomenon, the balls he throws into the air seem to stop adhering to the strict laws of physics part of the way through his throw. As can be proven in simple demonstrations things tend to fall toward the largest center of gravity, and items in motion do not remain statically suspended, unless other forces are at play as well.[citation needed]

The joke here is partially making fun of the idea that in a comic, the visuals of juggling would be the same as the visuals sitting in place in the air. So at first while reading, we assume Cueball is juggling, until it is revealed he has no control over the position of the balls at all.

Cueball is understandably perplexed, but instead of ascribing the event to some inexplicable supernatural agent, he concludes that the book's juggling instructions were faulty and throws it away. The title text furthers the joke by implying the book too seems to have become caught up in this phenomenon, which might now occur whenever Cueball throws something.

Many things could be taken away from this. Perhaps Cueball is so spectacularly bad at juggling that his failure breaks the laws of physics. Or perhaps the book assumes gravity and momentum are present where you choose to

juggle. Or perhaps the book merely instructs you how to juggle like the picture on the front of the cover, where the balls can also be thought to hover.

However, it seems that for some reason physics has only stopped acting on these objects as Cueball himself jumps and falls back down without any trouble and the book was previously on the floor, implying it had been dropped there.

While it is possible to reach zero gravity (or at least microgravity), there is no place in our universe where objects with mass have no momentum. Some possible explanations might be that Cueball is outside of our universe, he has just discovered something that's theoretically impossible, or he is just dreaming, or Randall has taken comedic license on the "momentum" part for the sake of the joke. Or he could be in a place where the surrounding fluid, instead of having the normal properties of earth's atmosphere, is a very thick or viscous fluid in which things simply become stuck. Or, perhaps the fourth wall is broken, and Cueball doesn't recognize he's in a webcomic, but we do.

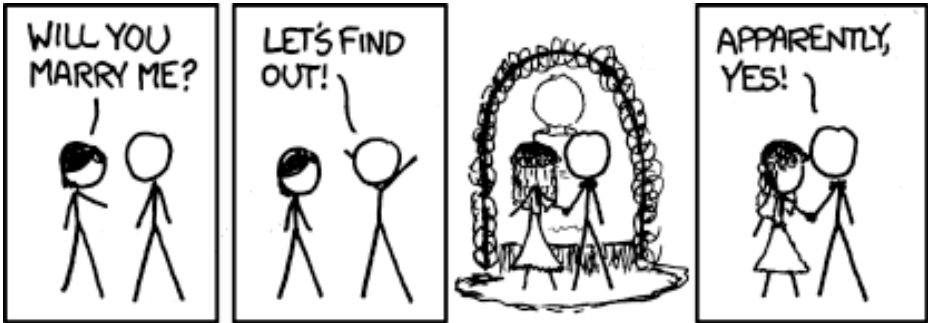
This may also be a reference to a motto often brought up in the *Hitchhikers Guide to the Galaxy* series: if you forget about physics, they will forget about you.

This comic is part of the following unpublished comic from the five-minute comics; specifically the unpublished fourth part.



## #943: Empirical

*August 26, 2011*



I'm as surprised as you!

## Explanation

When faced with the question "Will you marry me?", Cueball approaches the question in an empirical way. The word empirical denotes information gained by means of direct observation or experiments. In this comic, Cueball completes the "Will you marry me?" experiment, by actually getting married (as opposed to deciding on the spot or taking time to think) and the results are "yes".

The word "will" has two meanings: auxiliary verb of the future and disposition to do something. In the first sense Cueball cannot answer this question since he cannot know the future. Of course the question Will you marry me? uses the verb will in the second sense.

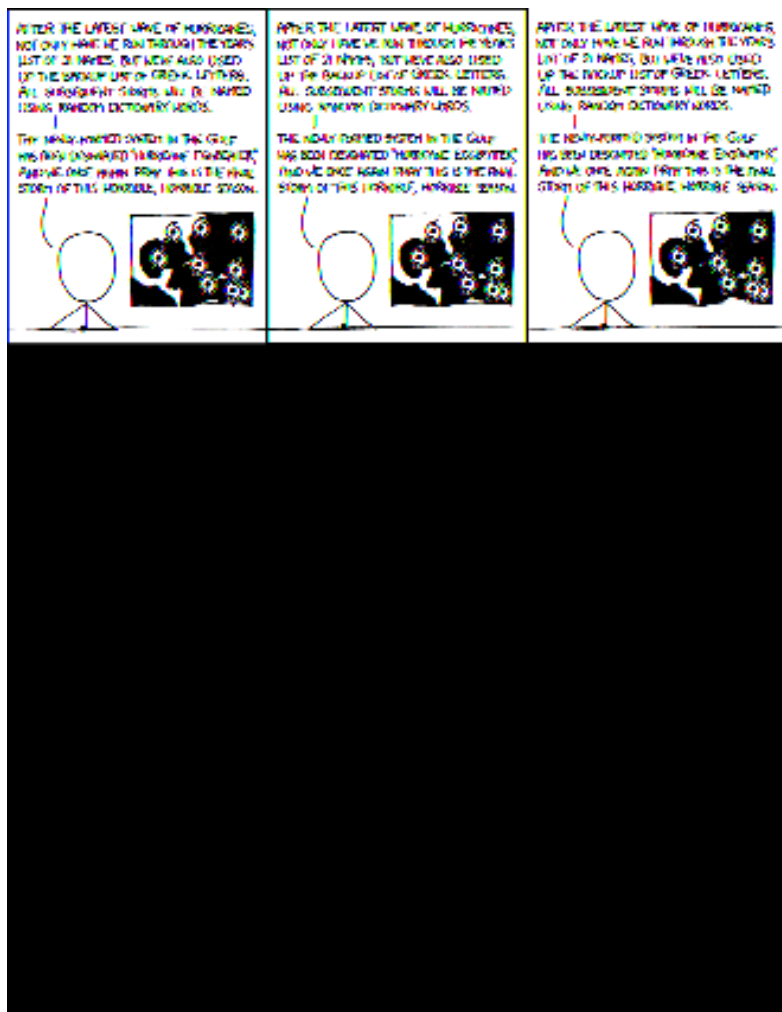
This comic is likely a reference to Randall's marriage around this time.

The title text states that Cueball is surprised by the results, suggesting that Cueball actually was not confident of his ability to marry, meaning that perhaps the marriage is not in good standing.

This is similar to 1088: Five Years.

## #944: Hurricane Names

August 29, 2011



After exhausting the OED, we started numbering them. When overlapping hurricanes formed at all points on the Earth's surface, and our scheme was foiled by Cantor diagonalization, we just decided to name them all "Steve".

Your local forecast tomorrow is "Steve". Good luck.

## Explanation

The World Meteorological Organization (WMO) maintains lists of potential names for tropical cyclones in each tropical cyclone basin; Regional Specialized Meteorological Centres (RSMCs) and Tropical Cyclone Warning Centres (TCWCs) are responsible for assigning those names to tropical cyclones within their respective areas of responsibility. In the North Atlantic Ocean (including the Gulf of Mexico and Caribbean Sea as pictured), the NOAA's National Hurricane Center (NHC/RSMC Miami) gives names to tropical cyclones (of which hurricanes are a subset), going through the alphabet (excluding Q, U, X, Y, and Z) and resetting at "A" at the beginning of the year. For example, the North Atlantic storms in 2012 were named "Alberto", "Beryl", "Chris", "Debby", and so on. There are six lists of names for the North Atlantic Ocean, which rotate every six years. Storms that are extremely catastrophic are removed from the lists.

If there were more than 21 hurricanes in a season before 2021, the 21-letter alphabet becomes exhausted and the hurricanes are named with Greek letters. This has happened only twice: in the 2005 Atlantic hurricane season, see 1126: Epsilon and Zeta, and in the 2020 Atlantic hurricane season. In 2021, the World Meteorological Organization ended the use of the Greek alphabet ([broken link](#)) and unveiled a supplementary list of names to be used in event of exhaustion.

There have never been enough cyclones in one season to exhaust both the English and Greek alphabet (which would require more than 45 cyclones in a season; the most so far has been 30), and Randall is hypothesizing what the names would be if this happened. In the comic, the NHC has named the hurricanes using random words out of the Oxford English Dictionary (OED). The humor here is intrinsic: "Hurricane Eggbeater" is a bizarre and hilarious name (and may also refer to how an eggbeater spins and 'destroys' an egg in a similar manner to how a hurricane might affect the surrounding area). The place in the image shown is the Gulf of Mexico and its surroundings, with the land being white, and the ocean, black.

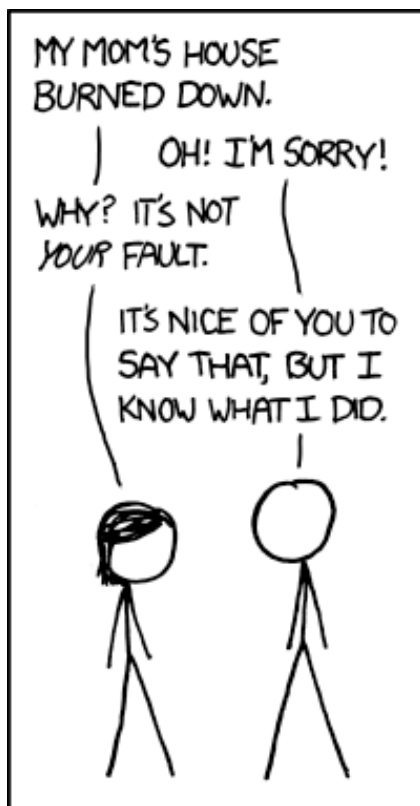
The title text takes this already surreal twist to an even more ridiculous extreme, where an impossibly long hurricane season exceeds 300,000+ storms and exhausts the OED completely. Even when the NHC starts referring to them using counting numbers, which will be sufficient to cover an infinite number of hurricanes, they are foiled by a theorem in set theory. In mathematics, the set of all counting numbers is a countable set (as are the set of all integers or all fractions) whereas the set of all points on a surface is an uncountable set (as is the set of all real numbers). Cantor diagonalization is a famous proof that it is impossible to map objects from an uncountable set one-to-one with objects from a countable set. Applying this theorem to hurricanes, if there were to be one hurricane for every possible point on Earth's surface, it would be impossible to assign a

distinct counting number to each one. This of course defeats NHC's last-resort naming scheme, but more pertinently, human civilization would be in a lot of trouble.[citation needed]

At this point, the meteorologists give up and decide to name all the hurricanes "Steve", which is popular on the internet as an arbitrary, generic name. Ironically, this makes "Steve" no longer arbitrary. The reporter then goes on to tell people that their forecast is "Steve" meaning that the hurricanes are everywhere. He says "good luck", which is probably because there are currently hurricanes on all points of the Earth's surface at the time of his speaking.

## #945: I'm Sorry

August 31, 2011



IT ANNOYS ME WHEN PEOPLE  
INTERPRET AN OBVIOUSLY  
SYMPATHETIC "I'M SORRY" AS  
AN APOLOGY, SO I'VE STARTED  
RESPONDING BY MAKING IT ONE.

You know I've always hated her.



## Explanation

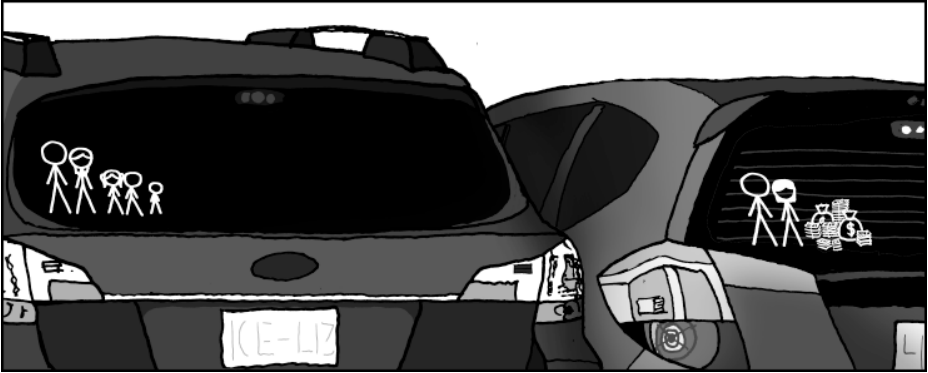
The term "I'm sorry" expresses a general feeling of sorrow or grief. It can be used either as an apology (expressing sorrow for one's own actions) or of sympathy (expressing sorrow for someone else's misfortune). Both uses are normal and acceptable, and the distinction is generally clear from the context. Some people deliberately conflate the two uses, treating an expression of sympathy as if it were an apology. This confusion is almost always feigned, as both uses of the term are well understood.

As it says below the comic, when Megan rejects his sympathetic "I'm sorry" by treating it as if it were an apology and saying it was not his fault, rather than just agreeing with her, an irritated Cueball implies that it was always intended as an apology, because he DID, in fact, burn down her mother's house. It is unlikely that he actually burned her house down, but rather is simply teaching Megan a lesson not to nitpick so much.

The title text has Cueball further attempting to convince Megan that he is not just being sarcastic, but really did set the fire, for the simple reason that he hates her mother.

## #946: Family Decals

*September 02, 2011*



My decal set has no adults, just a sea of hundreds of the little girl figures closing in around a single cat.

## Explanation

There exists a current fashion among car owners to place decals on their back window that represent their family. The decals consist of stick figures to depict the parents and children, perhaps shown doing a favorite activity, and even pets.

The first car window features a couple with three children, while the other shows just a couple (Cueball and Megan), with piles of dollar bills and two large bags with dollar signs on them. The humor comes from the opportunity cost implied in this — not having children allows you to avoid the expense of raising them and accumulate money for your own use.

One might expect that the cars would represent the difference in wealth, and they are identified as 'urban SUV' and 'sporty hatch back' in the official transcript. The larger car is a Subaru Outback which is a typical car used by families. The second car is a Honda Fit, which is a budget compact hatchback, in the comic it has a spoiler added. The Subaru Outback is more expensive now than the Honda Fit, which seems to fit perfectly with the comic's implication since a family of five have to buy the large expensive hatchback. Being able to buy a smaller car that doesn't need to hold a five member family also allows you to save more money.

The title text refers to the humorous description of cats as the real masters of their household, and the little girls

surrounding the cat refers to their ability to influence humans with their cuteness (as referenced in 231: Cat Proximity). One implication might be that any adults in the household act childishly around the cat, so they are best depicted as children. The title text could also be a reverse of the stereotypical "crazy cat lady". Instead of someone owning a very large quantity of cats it could be one cat with an ungodly number of little girls.

## #947: Investing

September 05, 2011



But Einstein said it was the most powerful force in the universe, and I take all my investment advice from flippant remarks by theoretical physicists making small talk at parties.

## Explanation

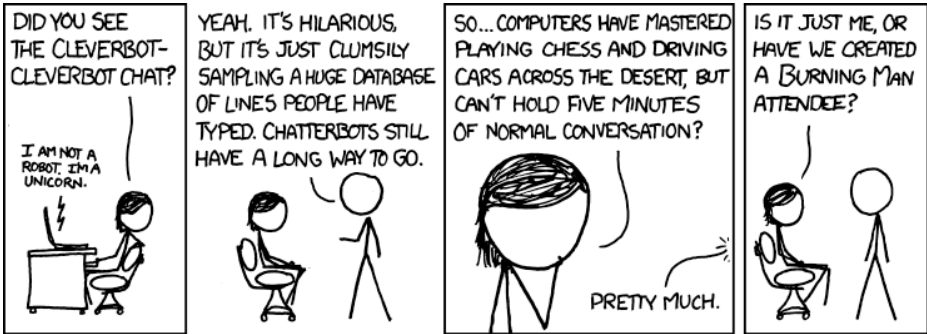
Compound interest is a type of interest in which the interest earned is added to the total amount, so that the interest itself then begins to gain interest in an exponential fashion. This contrasts to simple interest, where the amount used to calculate the interest will always stay at a fixed value. In economics classes, many teachers like to demonstrate extreme examples of compound interest, typically turning a thousand dollars into tens of thousands thanks to unrealistically high interest rates over several decades. But here, Ponytail discovers that a more realistic example is less than overwhelming. Instead of simple interest of 2% earning \$200 in ten years, with compounding \$219 is produced, hardly any better on a \$1000 investment.

There is an urban legend that Einstein said that compounding interest is the most powerful force. Snopes has its doubts about it.

The idea in the title text that people take advice from physicists making small talk is also referenced in 799: Stephen Hawking and 1206: Einstein.

## #948: AI

September 07, 2011



And they both react poorly to showers.

## Explanation

This comic is a reference to the wildly funny[citation needed] video of two Cleverbots talking to each other. By recording and analyzing whatever humans type into its input, they can sound pretty human to whoever is reading their response.

Megan has been watching the video and asks Cueball about it. He says it's just "clumsy sampling" as they are still very far from sounding like humans and holding normal conversations.

Megan then sums up that as of the release of this comic computers were good at chess and at driving cars through a desert. (Although some might think of deserts as a place with no obstacles to hit, one must also consider rocky deserts which are a rather difficult terrain to navigate: making this search field very interesting for space exploration as well. The ability of such self-driving cars would improve much later, with this comic being the first with a direct reference to them. Later, self-driving cars became a recurring topic on xkcd.) But they cannot hold a conversation for five minutes. And she thus concludes that a cleverbot would be perfect for attending Burning Man.

Burning Man is a week-long event held yearly in Black Rock City, Nevada. The festival encourages an artistic, anti-establishment philosophy and attracts a broad but devoted following combining hippies, anarchists,

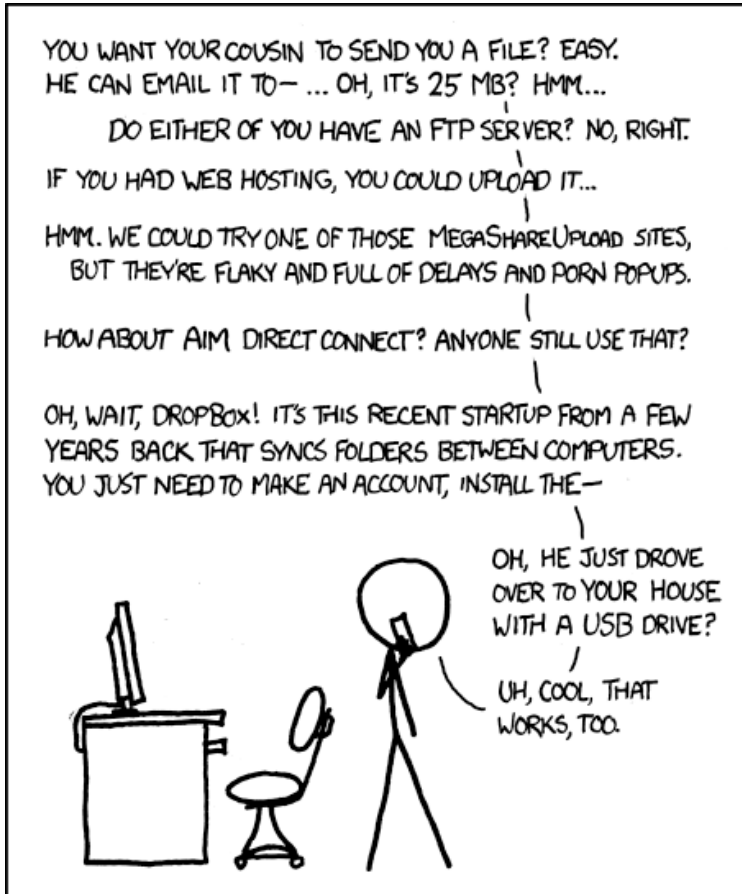


nudists, techno-utopians and survivalists. Shows of custom cars on the desert plain are a big part of Burning Man, and mental games like chess are a popular way to pass the time there. However, a common joke about Burning Man attendees is that they can only talk about Burning Man - hence why they can't hold a five minute conversation.

A tradition of Burning Man is not to shower while you are there, mostly because all water must be brought in from offsite. And of course Cleverbot reacts badly in showers because if you do try to shower a Cleverbot, you end up with a shorted out computer.

## #949: File Transfer

September 09, 2011



I LIKE HOW WE'VE HAD THE INTERNET FOR DECADES,  
YET "SENDING FILES" IS SOMETHING EARLY  
ADOPTERS ARE STILL FIGURING OUT HOW TO DO.

Every time you email a file to yourself so you can pull it up on your friend's laptop, Tim Berners-Lee sheds a single tear.

## Explanation

Cueball is trying to help two people, his friend and his friend's cousin, exchange a 25 MB file. Most people know how to use email to send files through the internet, but (as of 2011 when this comic was published) 25 MB exceeds the attachment size limit of most email services. The reason there is a limit is because every email has to be transferred between several mail transfer agents, and each one has to temporarily store a copy of the email. Space constraints on those mail servers means that they must impose size limits, and an email with such a large attachment will therefore not be delivered.

The next option is to upload the file to an FTP server (FTP stands for File Transfer Protocol, as opposed to HTTP, Hypertext Transfer Protocol), used to transfer files between computers on a shared network, such as the internet. However, FTP servers are a touch more esoteric than a mere email attachment, and many internet users don't have access to one of their own.

Web hosting is simply the ability to create a website and store all the data for said website on a server which is connected to the internet. If Cueball's friend's cousin had the ability to do that, sharing the file would be as easy as putting a copy of it in an accessible directory and sending the link to the desired recipient.

Megaupload was one of many sites on the Internet that recognized most users' inability to host large files on their

own, and so offers to host large files, sometimes for free, sometimes for a small fee. The payoff is that in order to make such a service profitable, many of these sites are cluttered with banner and pop up ads in a mad effort to squeeze as much ad revenue out of every page view as possible. It's not a dealbreaker for some, but Cueball seems to think it'll be too much for his friend's cousin to handle.

AIM Direct Connect was a file sharing system on AOL Instant Messenger, which was already suffering severe drops in popularity by the year 2000. Clearly, Cueball is grasping at straws here: anybody desperate enough to invoke the name of AOL as a solution instead of a problem must be at their wits' end.

Dropbox is a program with a web-based GUI that automates file sharing between two computers on the internet. But this solution also has its issues, as it requires that at least the sending party has a Dropbox account. Installing Dropbox software is not actually required, since Dropbox also provides a web interface for uploading and downloading files. At the time of the comic's publication, Dropbox was still relatively new and unknown, thus why it is not Cueball's first suggestion.

While Cueball is still explaining Dropbox, the friend's cousin has copied the file to a USB drive and physically transported it to the friend's house, circumventing the Internet entirely. It's not an elegant solution, but sometimes traditional methods are the most efficient ways to get something done.

When used to transfer files between computers in the same room or building, this same approach is referred to as sneakernet. This comic is also an illustration of what Andy Tanenbaum said in 1989: Never underestimate the bandwidth of a station wagon full of tapes hurtling down the highway. Sneakernet was examined in this What If article.

Tim Berners-Lee developed the HTTP protocol, the HTML markup language and the first web browser. Therefore he is considered to be the inventor of the World Wide Web. He envisioned originally an interactive web, where it would have been possible for the users to change a website directly using the browser, which would have made it possible to upload a file directly to a webpage:

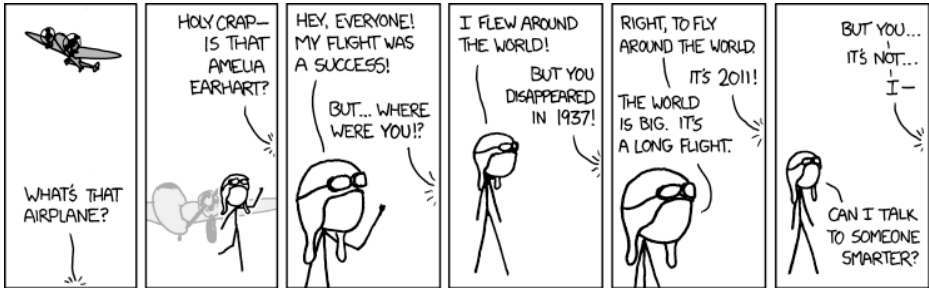
In contrast to this, a static web ("Web 1.0") came alive, which developed then later to the interactive "Web 2.0" we know today. Wikis like this website, where the page content is editable via forms, are a perfect example for this "emulated interactivity". From the technical point of view, the webpage is still static and the browser is just a viewer for html pages with the limited possibility to send some form data to the server. Scripts on the server, which process this form data, then change the web page. This mechanism is a more complicated work-around for what Tim Berners-Lee originally planned.

Dropbox and the web interfaces of email providers are further examples of this "emulated interactivity". The title text assumes, that Tim Berners-Lee feels probably

generally sad, that his invention developed into this unnecessary complicated way and misusing emails (maybe even via the web interface of email providers) for file sharing is therefore especially painful for what could have been so simple.

## #950: Mystery Solved

September 12, 2011



The Roanoke Lost Colonists founded Roanoke, the Franklin Expedition reached the Pacific in 2009 when the Northwest Passage opened, and Jimmy Hoffa currently heads the Teamsters Union--he just started going by 'James'.

## Explanation

In this comic, aviation pioneer Amelia Earhart's plane comes back to land after it went missing in 1937. It was presumed that Earhart was dead and that her plane went down into the ocean at some point during her journey, although various alternate theories have arisen since then, with no clear answer to the mystery. However, this comic proposes a much simpler explanation: there was no disappearance, it just took her 74 years to fly around the Earth. This explanation is simple, but impossible.

Earhart seems to think the person she is talking with is stupid for not comprehending such a simple answer, but in fact her explanation raises a multitude of other questions. Among them:

- How did it take so long for her to land? (She answers that the world is big, but it isn't so big that it takes 74 years to fly around it, even with 1937 technology. Earhart had already completed the majority of her journey before disappearing, and had "only" to cross the Pacific Ocean -- with stops in Howland Island and Hawaii -- before returning to her point of origin in Oakland, California. Had her flight succeeded, she could have completed it within three days of when she was last seen.)
- How did she survive that long, apparently without aging?
- Why didn't her plane fall apart (as even one year of



continuous flight would have induced considerable depreciation (wear and tear) on many of the plane's mechanical components, and Amelia Earhart could not have repaired the plane while flying it)[citation needed] or run out of fuel?

- Why didn't anyone else see her on her journey or at least detect her with radar?
- Why doesn't she know that a flight shouldn't take 74 years?

Another possibility is that she did not just fly around the earth, but flew very fast (near light speed) for 74 non-subjective years to return without having aged much. However, this would not explain why she thinks it is a long trip around the earth, and it raises the additional questions of how she would accomplish this feat in a twin-engine monoplane and how no one else noticed any signs of her plane traveling near light speed, such as a 74-year-long sonic boom.

Earhart's disappearance gave birth to many conspiracy theories. One of these, which was explored in the TV series *Star Trek: Voyager*, involves her being abducted to another part of the galaxy, where she was left in cryogenic stasis until found by the *Voyager* crew. Something similar could be the case here, having Earhart frozen by aliens until 2011.

The title text lists a few more deceptively mundane answers to long-unsolved mysteries that at first seem to dispel the questions with boring logic, but in fact raise

more questions than they answer. The first is the lost colonists of Roanoke, who were one of the first groups to come to North America, but then suddenly disappeared, leaving their colony untouched. The comic suggests that they simply left to found Roanoke, Virginia. Like all the other explanations in this comic, this doesn't explain how this simple solution became lost to public knowledge. It also doesn't explain why they abandoned their original colony, or how they made it to Roanoke, Virginia, which is more than 300 miles away, or where they were between when their colony was found abandoned in 1590 and when the future Roanoke, Virginia, was established over 200 years later, in the nineteenth century.

The second mystery in the title text, the Franklin Expedition, was a British voyage in 1845 to study the Northwest Passage that also disappeared, somewhere in northern Canada. The text suggests that the expedition wasn't lost; it was still exploring and eventually found its way to the Pacific Ocean in 2009. This is impossible, because the men on the expedition would be long dead. As a side note, both of the Franklin Expedition ships were eventually found wrecked in the years after this comic was published: one in 2014, and the other in 2016.

The final mystery is Jimmy Hoffa, the famous Teamsters Union leader who went missing in 1975 and declared dead in 1982 (possibly murdered). The comic says Jimmy simply opted to switch to the more formal version of his name; again, this raises the question of how such a thing would be possible without anyone noticing. From

1998-2022, so at the time of this comic's publication, the head of the Teamsters was in fact named James Hoffa (he is Jimmy Hoffa's son and goes by "James P. Hoffa" professionally); the comic could be implying that the senior Hoffa is not only alive but actually impersonating his own son, which would raise the question of why the supposed "son" doesn't look suspiciously older than he claims to be.

## #951: Working

September 14, 2011



IF YOU SPEND NINE MINUTES OF YOUR  
TIME TO SAVE A DOLLAR, YOU'RE WORKING  
FOR LESS THAN MINIMUM WAGE.

And if you drive a typical car more than a mile out of your way for each penny you save on the per-gallon price, it doesn't matter how worthless your time is to you--the gas to get you there and back costs more than

you save.

## Explanation

This comic is a jab at price-gouging shoppers who spend large amounts of time checking multiple shopping outlets for the best deals. The minimum wage is the lowest possible wage that a person could legally be paid, usually only targeted at providing unskilled laborers with an equitable level of income. In 2011, when this comic was published, US Federal minimum wage was \$7.25 an hour, though certain states and cities typically have higher minimum wages. Using simple math, the caption states that a person is effectively working below the minimum wage when they spend their time looking to save a few cents on their purchases. (Randall's math checks out:  $\$7.25/\text{hour} \times \text{nine minutes}$  would equate to just over \$1.08.)

Benjamin Franklin's adage "A penny saved is a penny earned" is usually taken to mean that a person, merely by making the effort to save their money rather than spending it frivolously, has put in worthwhile effort that makes them deserving of that money. Cueball flips the meaning of the phrase, instead saying that saving money is work just like a job, and as one would not take a job that paid less than minimum wage, the compensation is inadequate for the amount of effort it would take to drive to a cheaper gas station.

Of course, if you are unemployed and cannot expect to get any wages it could still be worth your time.

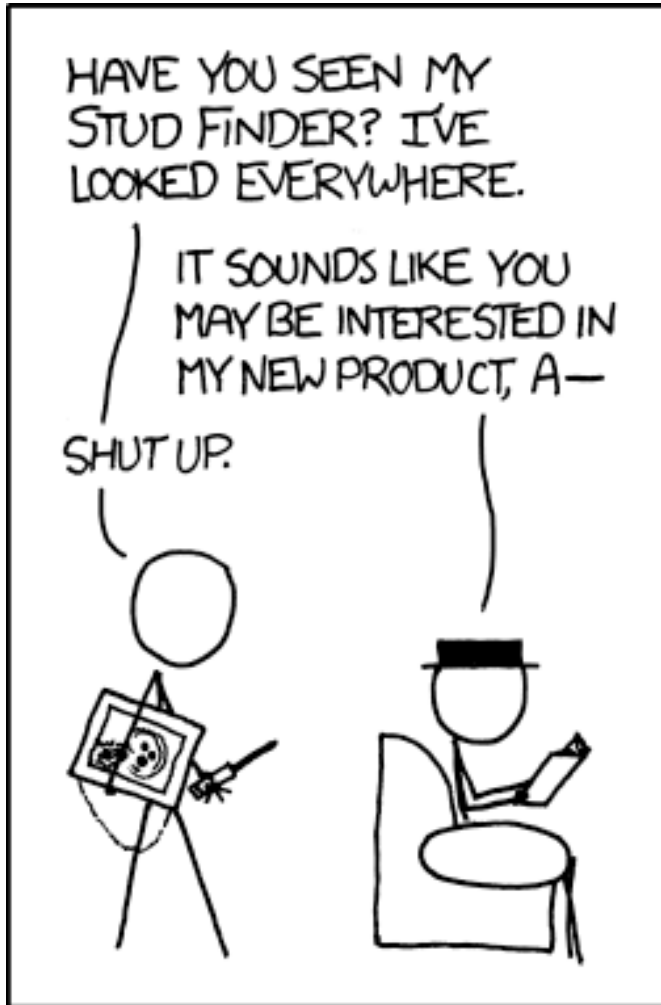
The title text, however, then goes on to talk about how the extra fuel consumption involved in finding cheaper gas leads to more extra money being spent on gas than is actually saved at the cheaper outlet.

This problem has also been examined in What if? - Cost of Pennies. See also 1205: Is It Worth the Time?.

However, Randall neglects to consider the effect that customers have on prices. If customers consistently go out of their way to get the lowest prices, then sellers will be motivated to lower their prices to attract customers. On the other hand, if customers consistently purchase from the most convenient seller, then sellers can raise prices without losing business.

## #952: Stud Finder

*September 16, 2011*



According to every stud finder I've tried to use, my walls contain a rapidly shifting network of hundreds and hundreds of studs.



## Explanation

It sounds like you may be interested in my new product, a— stud finder finder.

Cueball cannot locate his stud finder, so Black Hat begins a sales pitch, presumably for a "stud finder" finder. The joke is in the irony of having to find something that is used to find other things. Cueball interrupts Black Hat before he can make the obvious joke. The same comic technique is used later in 1059: Bel-Air. Currently no product exists that will locate a stud finder, although online review compilations are useful for finding the right stud finder to buy.

Studs are vertical wood members in wood-framed construction common in North America, although steel framing has become a popular alternative. These supports reinforce a wall at regular intervals, typically 16 inches (about 40 cm), and at corners, windows, and doors.

One might want to know the locations of studs within a wall for installing wiring, mounting shelves and heavy objects to walls, or in this comic, hanging a picture. In constructions with mostly solid walls, discovering (and avoiding) any previously installed electric cables or pipes is as important a prelude to any new drilling of holes or hammering of nails, and the same or similar detectors aim to reduce that risk.

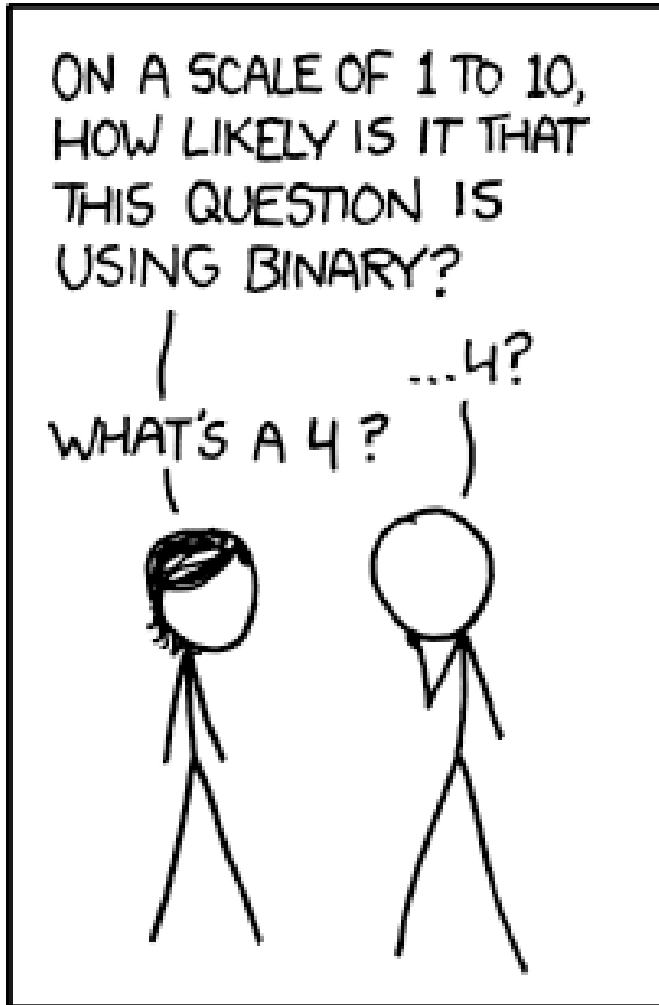
There are circumstances that can fool stud finders. Most are designed for the drywall-over-wood-framing construction, and can be fooled by older plaster and lath construction where the density is much more uniform throughout the length of the wall. Lower quality stud finders can also be fooled by things like moisture in the drywall or wiring within the wall cavity, and may thus beep when there is not a stud behind the scanned location. As a result, many people will try alternatives such as using a magnet to find the drywall screws or nails, or tapping a finishing nail through the wall to see if there is a stud underneath.

At the title text, Randall just gives up. Assuming there was no electrostatic interference, a stud finder going off randomly would indicate lots and lots of studs at random places that change position.

The idea of a "something doer doer" was explored again in 1821: Incinerator, the title text of 2376: Curbside, and 2382: Ballot Tracker Tracker. 2222: Terminator: Dark Fate also features a "person stopper stopper".

#953: 1 to 10

*September 19, 2011*



If you get an **11/100** on a CS test, but you claim it should be counted as a 'C', they'll probably decide you deserve the upgrade.

## Explanation

The binary numeral system refers to a counting system in base-2, which uses only the digits 0 and 1, as opposed to the more familiar base-10 decimal system, which uses the digits 0 through 9. In this case, the scale of 1 to 10 is using binary, so in decimal it would be a scale of 1 to 2. Since 4 in binary is "100" it doesn't fit into the range "1" to "10" in a binary system. And Megan doesn't even know the number "4" because she's only working on the binary system, this character does not exist for her.

It is also possible that Megan is using base-3 or base-4, both of which don't have a 4 (base-3 counts 1, 2, 10, etc., and base 4 counts 1, 2, 3, 10 etc.)

It should be noted that if Megan is speaking out loud in such a way that confuses Cueball, she would be saying "ten" out loud; this would automatically indicate she is indeed using base-10 (or higher). The correct pronunciation of "10" in base-2 is "one zero", so Megan is lying to Cueball.

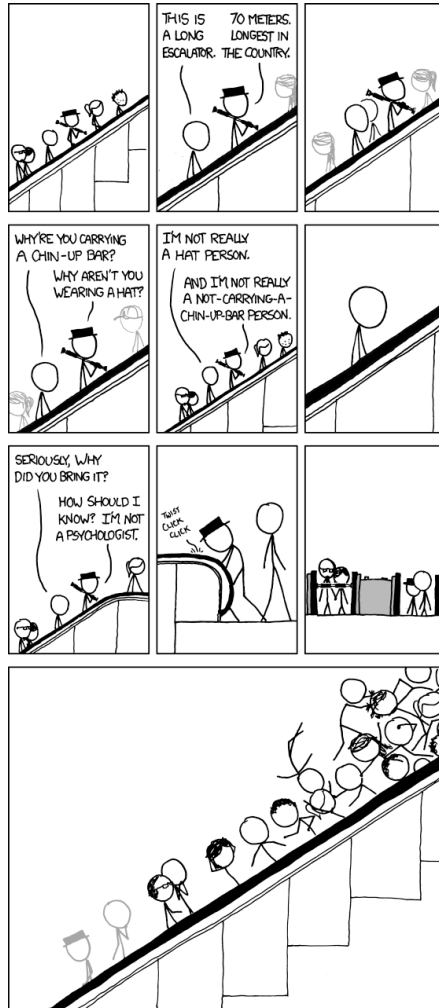
The title text uses a similar joke. Since test scores are usually written as either a letter grade or a percentage, 11 correct questions out of 100 would be a failing score in decimal notation. However, 11/100 in binary translates to 3/4 in decimal, which would be 75%, accepted in most classes as a 'C' grade.

It could also be argued that a score of 11 should count as

a "B", as 11 is B in hexadecimal; however, this link is a bit more tenuous, as the whole score would then be interpreted as "B/64".

## #954: Chin-Up Bar

September 21, 2011



Those few who escaped found the emergency cutoff box disabled. The stampede lasted two hours and reached the bottom three times.

## Explanation

Black Hat has once again showed everyone that he is a classhole, with a plan to block traffic on presumably the longest single-tier escalator in the Western hemisphere.

It is possible that Randall was referring to the Wheaton station in Washington D.C.'s Washington Metro subway system, where a 70-meter (230-foot) escalator is. It's clear that Black Hat knows it is the longest and that this is the reason he has chosen this exact escalator for his plan. However, if this is Wheaton Station, the comic's depiction of the escalator has several inaccuracies, meaning it is most likely situated in xkcd-land instead of real-life:

- The Wheaton station has three escalators.
- There are no vertical and perpendicular lines on the side of the escalators. Instead, they are perpendicular to the guard rail.
- In panel 9, there are two raised disks between the up and down escalators. While this is true in some escalators, the ones for Wheaton are very close together and there is only one column of raised disks.
- The up escalator leads to a fare gate where there are employees staffed near an elevator control kiosk who will help the elevator people.[citation needed]

Black Hat uses sly conversing methods to avoid saying his true motives for carrying a chin-up bar. Black Hat

continues deflecting Cueball's questions by stating that he's not a psychologist, although he clearly is aware of his own motives and intentions. (One could argue that it would take a psychology degree to explain those motives and intentions.) After this they reach the top and once they get off Black Hat quickly turns around and locks the bar in place at about waist height (i.e. as high up as possible on an escalator), just before the moving part of the escalator ends.

Chin-up bars are typically capable of holding up a 300 pound (130 kg) person without moving, and a bar like Black Hat has brought with him can be installed easily in a doorway, or in the opening of an escalator...

The unexpected appearance of a solidly attached bar at the top of a crowded escalator could be disastrous. The first people would probably stumble backward to avoid it or hit it and topple backwards, and collide with the passengers immediately behind them, knocking them off their feet and likely creating a domino effect all the way down. Indeed, this is exactly what happens and is depicted in the last panel. Black Hat and Cueball are seen on the descending escalator in the background, Cueball has turned around looking at the scene and displaying worry about what Black Hat has done, but Black Hat isn't even looking at the chaos he has caused, completely ignoring all the falling bodies. Although it might be possible, the two are fairly lucky to be unscathed, as they could have been hit by someone in the pileup falling all the way over in their side of the escalator. Since they are most likely on the way down to a subway, the traffic

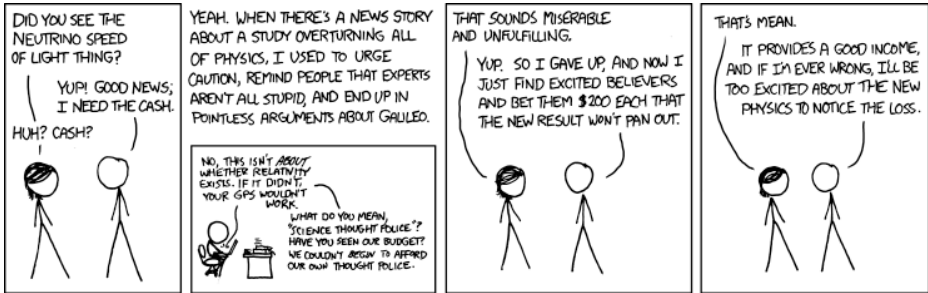


should make it easy for them to get away on the next train, before anyone has a chance to try and find the perpetrator, so Black Hat gets away with his schemes once again.

In the title text it is made clear that the few people that actually escaped the moving stairs were unable to use the emergency shutdown because Black Hat had disabled the system, presumably before ascending in the first place. This is stated to have caused the stampede to last for two hours and waves of falling people would end up reaching the bottom three times, before ascending with the stairs again. The reason for this extended mayhem could be that only the very first people at the top of this domino effect who actually hit the chin-up-bar know what caused the problem to begin with. Since they are likely among those people too hurt to explain anything in time, the next group of people trying to get out after the first wave of falling people might just proceed to run into the same problem at the top once again. The problem is exacerbated by the disabled shutoff, so even if someone sees the chin-up-bar and knows how to escape, they would either be pulled back into the crowd of traffic or be free but unable to help. This helps to explain why the cycle of crowd collapse happened three times, and the use of the word "stampede" connotes the panicked, unorganized behavior of the trapped people that serves to make the problem worse.

## #955: Neutrinos

September 23, 2011



I can't speak to the paper's scientific merits, but it's really cool how on page 10 you can see that their reference GPS beacon is sensitive enough to pick up continental drift under the detector (interrupted halfway through by an earthquake).

## Explanation

The "Neutrino speed of light thing" mentioned in this comic was an actual story from the day before the comic was posted. An experiment at CERN caused a stream of neutrinos to be passed from CERN in Switzerland to a receiving station at the INFN laboratories of Gran Sasso in Italy (LNGS). The initial findings from the experiment were that the neutrinos arrived at the detector in less time than a beam of light would have taken. The neutrinos had apparently exceeded the speed of light. The experiment was indeed found to be flawed; the data was probably wrong due to a faulty connection on an optical fiber.

Albert Einstein famously posited that the speed of light in a vacuum is both constant and absolutely the fastest possible speed for any object in the universe. Nothing can accelerate to any faster speed. Therefore, a report that neutrinos have been found travelling faster than light challenges a fundamental law of physics and turns all of physics, or at least special relativity, on its head.

Prior experience has shown Cueball that in such cases, arguing with people and preaching caution is futile and will lead to "pointless arguments about Galileo". Galileo Galilei was famously convicted of heresy for his defending the heliocentric system, and is often used as an example of revolutionary ideas being suppressed by the powerful. Believers in the new findings would thus accuse Cueball and the scientific community of being as

stubborn and oppressive as the Inquisition in Galileo's time, and even compare them to the Thought Police from George Orwell's 1984, another popular archetype of oppressive measures. Ironically, Scientific American actually used the CERN data as an analogy for heliocentrism in an article on Copernicus and Galileo.

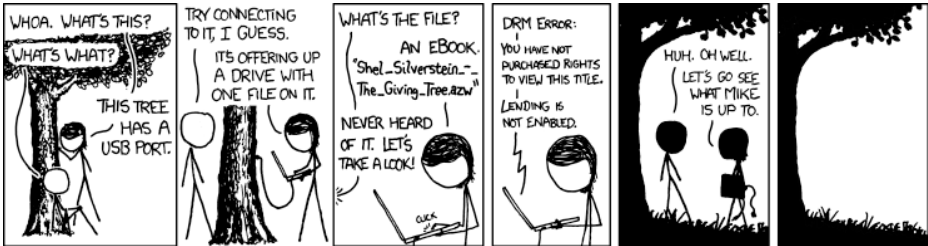
Cueball was arguing with someone who claimed relativity as a whole didn't exist. This would make GPSes unable to accurately calculate their velocity time dilation and gravitational time dilation and correct errors, making them produce widely inaccurate results.

Cueball realizes that it is more satisfying and profitable to place bets with them instead. His reasoning is that almost invariably, these supposedly world-changing discoveries end up falling apart after further investigation, and that if it doesn't, then the discovery itself will satisfy his scientific curiosity enough to outweigh his monetary loss. This is similar to Stephen Hawking's scientific wagers, where Hawking set bets such that, if he was wrong, he would be paid, and if he was right, he'd have to pay and wouldn't mind because he'd just have been proven right.

The title text is a reference to a graph published similar to, if not the same as, the one found here. The continental drift can be seen, as well as the clearly marked jump showing the earthquake in question.

## #956: Sharing

September 26, 2011



In the new edition of *The Giving Tree*, the tree uses social tools to share with its friend all the best places to buy things.

## Explanation

Cueball and Megan encounter a USB Dead Drop in a tree, placed in such a way as to simulate the tree itself having a "USB port". This might be a socket, perhaps Micro-A or USB-C type, to which a compatible USB cable can be attached from a computer (e.g. the laptop that Cueball and Megan happen to have with them, along with a suitable cable) or could in fact be a trailing length of cable and compatible USB plug to negate the necessity of their own adapter cable. USB standards were not originally designed with the idea of connecting two USB hosts together, but the intimation (perhaps in part by the lack of obvious power at the 'tree side') is that it is some form of peripheral device which the laptop can interrogate. Upon doing so, it reveals itself to be a data storage medium.

The Giving Tree is a book in which a tree gives everything it has to a little boy out of love and a desire for the boy's company: apples to sell, wood to build a house, even letting the boy cut it down to make a boat. At the end of the book, the boy comes back as a grown man and the tree tells him sadly that it has nothing else to give. The man tells the tree that he only wants a tree stump to sit on, and the tree gladly gives him that. Notably, the tree's moments of greatest distress come when it fears that it can give the boy no more and that the boy will leave it.

.azw is an e-book file format used and created by the

online company Amazon.com, which makes and sells the popular Amazon Kindle e-reader. Complaints against the format have been made concerning its closed nature: some people claim that all information should be free and imposing restrictions on its usage is limiting growth in the modern world. This comic was published two days before the release of the fifth generation of Kindles, alongside complaints that Amazon would continue to use Digital rights management "encumbered" e-book formats.

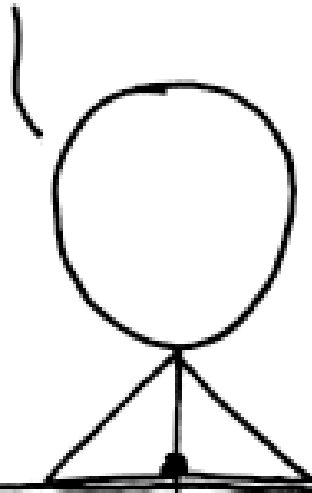
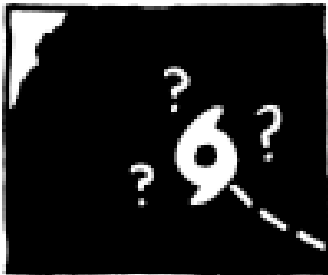
The comic is a criticism of the usage of DRM in digital commerce. The tree's willingness to offer up its file is parallel to the generous nature of the tree in *The Giving Tree*. The tree is prevented from sharing its file however, by DRM in the file. With nothing to gain from the tree, Cueball and Megan leave the tree alone, in a manner similar to the fears of the tree in *The Giving Tree*. The final frame is a reference to the iconic silhouette of a tree that is used in the loading screens of Amazon's Kindles, a link between the abandoned tree in the comic and an abandoned Kindle.

The title text is an elaboration on the idea of a more modern *Giving Tree*. While in the original book, the tree gives the boy various gifts, in the new, modern version, the tree shows "its friend" (presumably the boy) all the places the friend can buy things, using social media to do so. This, like the DRM on the book from earlier, is a criticism of some aspect of the modern world, in this case, the increased commercialism due to social media.

## #957: Development

*September 28, 2011*

FEAR TURNED TO CONFUSION  
TODAY AS HURRICANE RINA  
DEVELOPED TO PIAGET STAGE 5,  
WITH SUSTAINED INTERESTS IN  
OBJECTS AND THEIR PROPERTIES.



Funding was quickly restored to the NHC and the APA was taken back off hurricane forecast duty.



## Explanation

Cueball is a news anchor reporting on a hurricane.

NHC is the National Hurricane Center and the APA is the American Psychological Association.

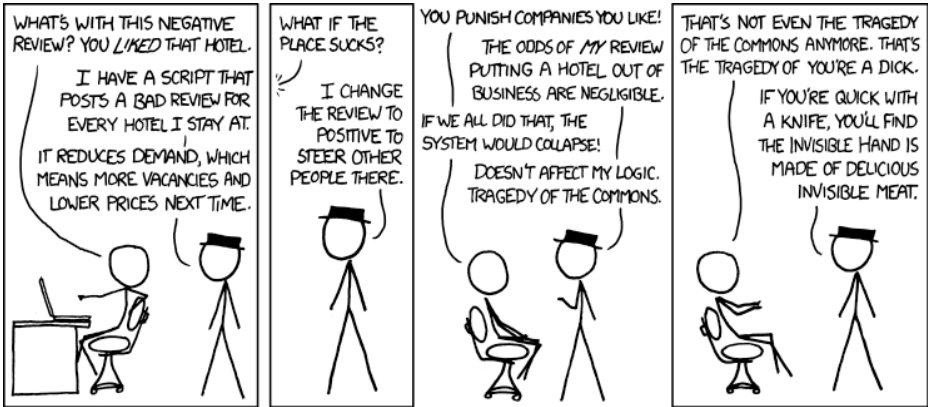
The reference to Piaget Stage 5 in the comic is a reference to Piaget's Stages of Development in which stage 5 is where (to quote Wikipedia and Gruber, H.E.; Voneche, J.J.. eds. *The essential Piaget.*)

This is exactly what the comic is describing in sustained interest in objects and their properties and the handy "?"s around the picture behind the newscaster in this comic.

With that out of the way, this comic is a pun on the use of the word "development" to classify hurricanes which also uses categories from 1 to 5 as defined by the Saffir-Simpson hurricane scale (Piaget's Stages go from 1-6). The comic is making a joke that if the APA were on hurricane forecast duty instead of the NHC, that the hurricanes would be classified with Piaget's stages instead of categories.

## #958: Hotels

September 30, 2011



'Rating: 1/5. Room filled to brim with semen, and when front desk clerk opened mouth to talk, bedbugs poured out.'

## Explanation

In this comic, Black Hat is giving all the hotels he has stayed at, likes, and wants to stay in again bad reviews, in order to lower demand for said hotel. He is simultaneously putting good reviews on bad hotels to steer other people there so there are more vacancies at good hotels. He also claims he is not influential enough to personally put the good hotels out of business. But even if he didn't put the hotels out of business, the market would certainly still be affected, and all so he could enjoy a lower price, once again proving he's a classhole.

Cueball objects that, if this practice became widespread, the good hotels would all go out of business. Black Hat responds by invoking the tragedy of the commons. The tragedy of the commons is a classic thought experiment which posits a group of farmers sharing a common grazing field. It would be in each farmer's self interest to graze as many cattle as possible to make as much money as possible. If all the farmers did this, they'd overgraze the land, ultimately making it useless for grazing. The "tragedy" is that, assuming self-interested farmers and nothing to restrict their actions, this outcome would be inevitable. Even knowing the dangers of overgrazing the land, each farmer would know that others would overgraze it, and therefore would want to profit as much as they could before it was all destroyed. Black Hat uses this to explain his own reasoning: his actions don't determine what other people do, he clearly rejects the

notion of an implied social contract, and so he's simply going to act in his own self-interest, regardless of whether other people do the same.

In the last frame, Black Hat references the invisible hand which is the term coined by Adam Smith and used by economists use to describe the self-regulating nature of the marketplace. Black Hat appears to be taking advantage of this invisible hand by cutting it with a knife and eating it.

The title text is an example of Black Hat's negative reviews, which in itself is a surrealist joke about the hotel. A somewhat believable (if exaggerated) set of complaints about an awful hotel would be : "Room filled to brim with bedbugs, and when front desk clerk opened mouth to talk, semen poured out". However instead, the objects of focus are reversed, creating a ridiculous scenario for the reader to enjoy, if they are not too disgusted by the imagery of the text.

## #959: Caroling

*October 03, 2011*



For a thousand generations we vowed never to forget how his soldiers feasted on our brother Stephen.

## Explanation

Here are the lyrics for the first verse of the Christmas Carol, "Good King Wenceslas"

While not a king, Wenceslaus I, Duke of Bohemia is considered a martyr and a saint. Far from being responsible for any massacre, he protected his subjects from external dominance and is still a national hero to the Czech people. Black Hat is supplying disinformation to unsuspecting carolers, either to shut them up, by making them falsely think that they are associating themselves with a morally reprehensible man, or just because he's a classhole like that.

The title text references "the Feast of Stephen", also known as the "Feast of St. Stephen" or "St. Stephen's Day", which is a holiday celebrated on 26 or 27 December by the Western or Eastern Church respectively. (For the Eastern Orthodox Church, which still observes the Julian calendar, it falls on 9 January of the Gregorian calendar.) It is not actually a feast that involved eating a person named Stephen.[citation needed]

If you look closely, you can see that the carolers may be a family. The man and woman are confused by what Black Hat has said, and the girl is looking to the adults, perhaps gauging their facial reactions, or just waiting for their reply.

## #960: Subliminal

October 05, 2011



Once you see it, you can't help seeing it every time. Until your body finishes metabolizing the mushrooms.

## Explanation

This comic is about the FedEx logo and how there is a subliminal/hidden arrow in the logo; specifically, in the whitespace between the "E" and the "x". When Cueball looks at the logo, he instead sees a wild scene including Guy Fawkes, Willie Mays and an assault vehicle. Megan then replies "...You either need more medication or less. Not sure which." Which is implying that he is taking medication for some condition that causes him to hallucinate (or something similar). The implication being that he either needs more medication because it isn't working properly, or less medication because it is causing him to hallucinate in itself.

Guy Fawkes was a British revolutionary who tried to blow up the Houses of Parliament in 1605. His likeness is nowadays used as a symbol of protest, most famously in the graphic novel and movie "V For Vendetta" and by Anonymous and the Occupy movement.

Willie Mays was an American baseball player for the San Francisco Giants who made a famous over-the-shoulder catch in the World Series. Some consider it to be the best defensive play of all time in baseball.

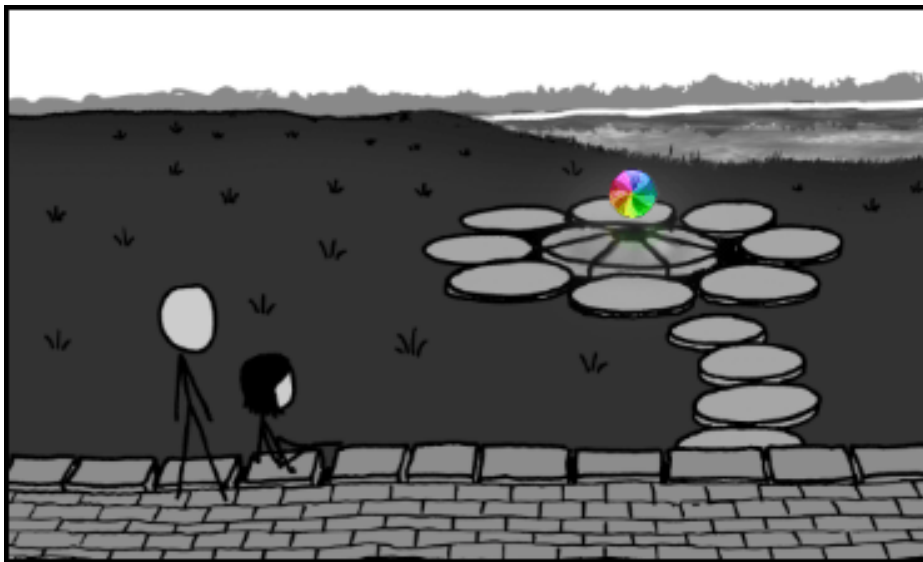
The title text is a play on the Internet idiom "once you see it, you can't unsee it," although it says that you can't unsee it until your body has finished processing the magic mushrooms, that you must have taken for some reason, which would be why you would keep seeing it in



the first place.

## #961: Eternal Flame

*October 06, 2011*



There's always the hope that if you sit and watch for long enough, the beachball will vanish and the thing it interrupted will return.

## Explanation

Steve Jobs died on October 5, 2011, the day before this comic was posted. He was the CEO and one of the founders of Apple, Inc. He was the head of Apple for the introduction of OS X, the default operating system used on all modern Macintosh computers. In OS X when there is a significant slowdown, the Cursor becomes the symbol seen in the comic. It may appear when an application is not responding, or if the computer is busy. This symbol is infamous among OS X users, and is nicknamed "the beachball of death". It appears during a lag, and can take a very long time to disappear, thus seeming endless. The title and rotating cursor above a fixture in the ground seems to be referencing the John F. Kennedy Eternal Flame, suggesting that the rotating cursor above the fixture is, in fact, a monument to Steve Jobs. A similar tribute comic was also dedicated to Terry Pratchett, the day after he died, in 1498: Terry Pratchett, to Gary Gygax, three days after he died, in 393: Ultimate Game, and to John Horton Conway, two days after he died, in 2293: RIP John Conway.

The title text refers to the fact that when an application is not responding on the Mac, the application sometimes recovers and the system comes back; other times, however, the damage is irrevocable, a Kernel Panic happens and the system needs a restart.

## #962: The Corliss Resolution

October 10, 2011

THE FERMI PARADOX:  
PLANETS ARE SO COMMON  
THAT LIFE SHOULD BE,  
TOO. SO WHERE IS IT?



WELL, NOW  
WE KNOW.

IT'S NOT THAT LIFE  
INEVITABLY DESTROYS  
ITSELF WITH WAR.



IT'S JUST THAT  
IT TAKES LONGER  
TO DEVELOP SPACE  
COLONIZATION



THAN IT DOES  
TO INVENT AN  
ACTIVITY

MORE FUN  
THAN SURVIVAL.



HOLY CRAP,  
I DON'T CARE HOW  
DANGEROUS IT IS.  
I HAVE TO TRY IT.

And no avian society ever develops space travel because it's impossible to focus on calculus when you could be outside flying.

## Explanation

Jeb Corliss is a professional BASE jumper and wingsuit flyer, like in the fourth panel. Corliss has jumped from a lot of different buildings and monuments in the world. He's publicly taken the position that the dangers of his activity are irrelevant, because the ability to effectively fly is so incredible and compelling that nothing can dissuade him from doing so.

The Fermi paradox is the question of why humans have yet to detect any evidence of extraterrestrial life. The name apparently arose from a discussion between Enrico Fermi and several other physicists, in which they were discussing the vastness of the universe and the huge numbers of inhabited planets that were likely, which supposedly caused Fermi to exclaim, "So where the hell is everybody?" The argument is that, given the number of intelligent species we were expect to exist in the galaxy, and the amount of time we would expect them to have existed, it's surprising that we haven't observed some evidence of their existence, or even been visited by them yet.

There are a number of different theories to explain this apparent paradox, ranging from life (or intelligent life) being rarer than we expect to the signs of alien intelligent being hidden or hard to detect, to the lifetime of an intelligent civilization being generally short. The last theory is most relevant to this strip, as some hypothesize that any sufficiently advanced civilization will develop

the tools to destroy itself, and will almost inevitably use them, sooner or later. This suggests that the galaxy may be littered with collapsed or extinct civilizations that never gained the means to contact us.

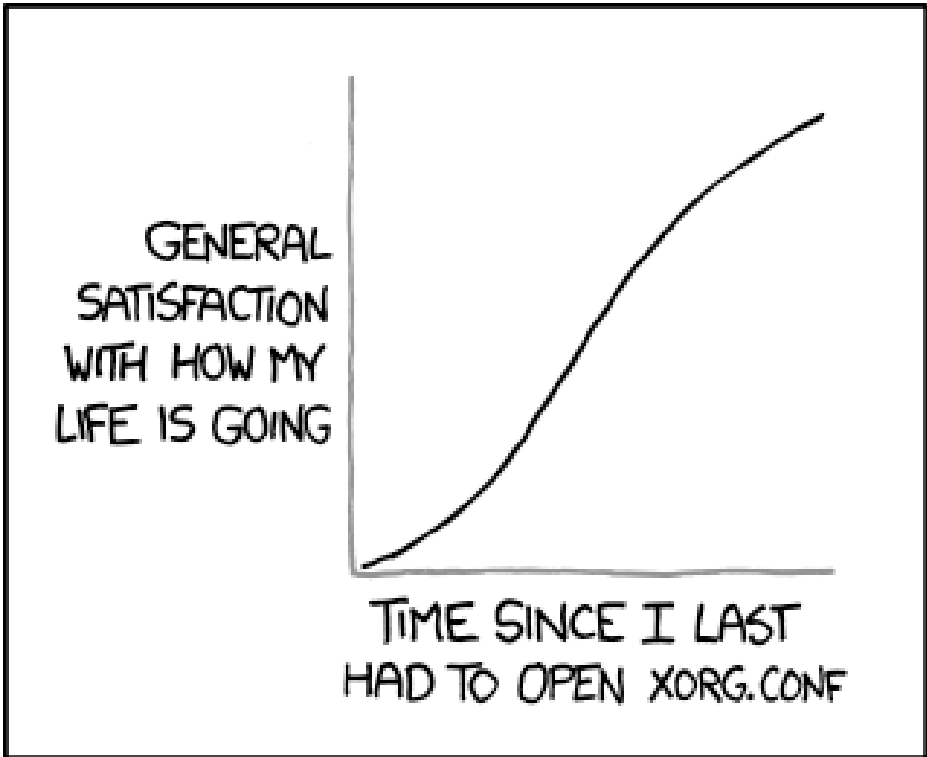
Randall proposes a different (and rather more fun) theory: before they can develop space travel and the like, civilizations will inevitably invent an "activity more fun than survival." That is, something fun that's also very dangerous, such as flying off a cliff in a wingsuit. This also suggests that most intelligent civilizations collapse, but instead of happening due to war or reckless science, it happens because something becomes so fun that beings do it until it kills them.

As said in the title text, a being that can already fly (hence "avian society") would probably prefer flying around outside over developing the tools needed for space colonization.

See 384: The Drake Equation for another comic about intelligent life in the universe.

## #963: X11

October 12, 2011



Thomas Jefferson thought that every law and every constitution should be torn down and rewritten from scratch every nineteen years--which means X is overdue.

## Explanation

X11, or the X Window System, is a computer software system and network protocol that provides a basis for graphical user interfaces (GUIs) and rich input device capability for networked computers.

The X11 stacks are usually implemented using a display server. The reason that it is called a display server is that the actual viewer and the server do not need to be on the same system; X11 frequently runs over a network connection. This adds considerably to the complexity of the mechanism.

Most UNIX-based operating systems, including many GNU/Linux distributions and the BSDs use X11 as their base graphical subsystem and thus always use a display server and a display client. macOS has built-in support for X11, but does not use it for normal applications. For Windows, commercial and free solutions implementing an X11 display client exist.

Until 2004, for most GNU/Linux distributions the default display server was XFree86. This project required a variation of the config file that Randall mentions. It was forked into Xorg due to disagreements over the development model.

Xorg is nowadays the default display server: X.Org Server (commonly abbreviated to Xorg Server, XServer or just X) refers to the X server release packages stewarded by



the X.Org Foundation, which is hosted by freedesktop.org, and provides an interface to the standard X Window releases for the use of the free and open source software community.

Every aspect of XFree86 and Xorg can be modified in numerous ways, all the way down to tiny behaviors such as the default window size, window-border snapping, mouse button maps or how a touchpad is used. All of these settings can be found in the `xorg.conf` file, a massive file with hundreds upon thousands of individual settings that have accumulated over the lifetime of the Xorg project. The full documentation for `xorg.conf` contains all the settings contained within the file. When a problem arises in the graphical portion of a desktop using the X server, the solution may be to edit the `xorg.conf` file. The soul-crushing prospect of having to open and look up the correct parameter out of thousands that is causing issues is enough to destroy a person's satisfaction with their life.

Editing `xorg.conf` (especially manually) is much less necessary than it used to be. In fact, some distributions do not even come with an `xorg.conf` file, because everything necessary can be auto-detected and/or configured elsewhere.

The Wayland project aims to replace some of X11 and not include any of the cruft that built up over the decades. It was started in 2008, way more than 19 years after the aforementioned config file turned into a hell.

The title text references a letter Thomas Jefferson wrote

to James Madison on the popular basis of political authority. There are a few quotes that can be pulled to sum up his ideas.

In his day most people lived only to age 55, so he supposes that a person reaches maturity at 21, and will live until 55 and then die. For the purposes of the other arguments he makes in the letter, he also supposes that all the people of a generation are born on the same day, and that they will all die on the same day: the day they turn 56.

Since only one generation is alive in his example, his model allows for that generation to do as they please for their time on earth, elsewhere in the letter he describes that each generation should not be able to leave the next generation in a worse position, so the debts accrued by one generation must be paid off by that generation. This has built us up to the quote that everyone attaches onto.

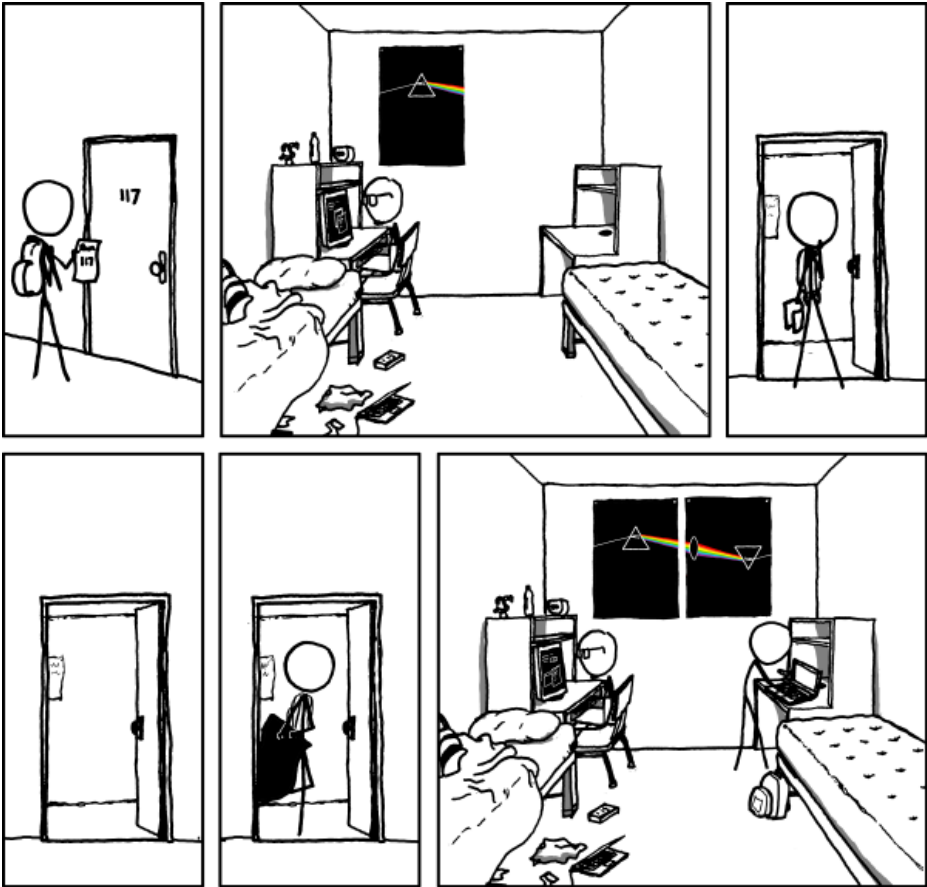
Because a generation reaches maturity at 21, and at that point the previous generation dies off, and this generation has 19 productive years until they are 40 and have 15 years of senility until their own death they have full reign of the earth as they please. Continuing on under the laws (and debts) of the previous generation is "an act of force, and not of right".

Jefferson picked 19 years because that was the length of time a generation spent in power, not that every 19 years all laws should be abolished, but that every generation, each new generation should tear down all the systems put

in place, re-evaluate, and build better laws, systems, and constitutions.

## #964: Dorm Poster

October 14, 2011



I was going to record an album with that cover under the name "PINK FTFY", so it'd come after them on the store CD rack. But at this point music stores are just rooms where CDs are set out to age before they're thrown away, so probably nobody would see it.

## Explanation

In this comic, Cueball, as a student, moves into a dorm. There is a poster on the wall with the album artwork, by Hipgnosis, for Pink Floyd's album *The Dark Side of the Moon*. It shows a beam of light passing through a dispersive prism and separating into a rainbow. This is a fairly common poster to have on a wall, particularly for someone in their late teens to early twenties, and is generally seen as a cliché. After thinking a bit, the new student makes a poster that uses a lens to reverse the rainbow into another prism, likely to mess with his new roommate. This idea actually isn't very innovative, because the original backside of the album contained the reverse rainbow and prism (but not the lens). The setup with two prisms was used by Isaac Newton to prove that white light is composed of different colors of light.

In the title text, Randall makes the joke that by recording a record under the name "PINK FTFY" (fixed that for you), the name of his band would come immediately after Pink Floyd alphabetically, so the album would be to the right of Pink Floyd's album for *Dark Side of the Moon*, allowing for the same image seen in the back of the dorm room to be on the shelves of the record store. Since the cover of his album would be catching the light from Pink Floyd's album and forming white light once again, Randall would be "fixing" the cover of *Dark Side of the Moon*. However Randall makes the crack that no one would see the joke, because of the fact that most music is bought and downloaded online, which has

significantly decreased the traffic to record stores in recent years - catastrophically so at the time of this comic's publication, before the popularity of vinyl rebounded in the late 2010s.

## #965: Elements

October 17, 2011



Of all the nations, the armies of the ununoctium-benders are probably the least intimidating. The xenon-benders come close, but their flickery signs are at least effective for propaganda.

## Explanation

In the popular children's TV show *Avatar: The Last Airbender*, the four nations that inhabit the world can each telekinetically control ("bend") one of the four classical elements: water, earth, fire and air. One person, the avatar, can control all four elements and is markedly more powerful than any other character. Dmitri Mendeleev is the creator of the modern periodic table, which categorizes the 118+ atomic elements by their atomic number.

The comic is comparing the control over more magical power with more practical, "science-y" power. Fire, boulders, and storms may be more impressive visually, but science has proven time and again that "boring" can have very practical, very deadly applications. Additionally, while the advantages of controlling the four alchemical elements are mostly physical and visible (characters in the show most often use their powers to push, throw, or create barriers), the phenomena related to Mendeleev's elements and his research include subatomic particle interactions. One power the depicted Mendeleev has that the Avatar definitely does not have is control over radioactive elements, and this is the subtle, slow-acting power he demonstrates.

The powers of the Avatar's world, moreover, generally require actual contact with the relevant element (or a material that is sufficiently composed within its sphere). An Earthbender typically cannot do anything to



manipulate rock or soil without touching some connected part of it, and cannot do anything if suspended in the air or (until they can learn to manipulate any of the "earth impurities" within it) restrained and enclosed by metal. Firebenders generally learn to make use of their own bodyheat, in a manner that seems initially inconsistent with the other bending disciplines but is hand-waved (in either sense) to be actually very effective, insofar as waterbending significant effects only using one's own bodily moisture is a far less prolific occurrence.

With this in mind, manipulating and coercing a particular element does not imply the ability to generate it from nothing. Mendeleev, therefore, should not be expected to spontaneously create any given rare element from nowhere, and (if true to the same philosophy, with the addition of modern scientific understanding of the elements) must therefore be either identifying and concentrating extremely small trace quantities already within reach (in order to weaponise the substance) or somehow be able to use his mastery of all elements to induce transmutation (via established fission or fusion processes from other types of atom under his full control).

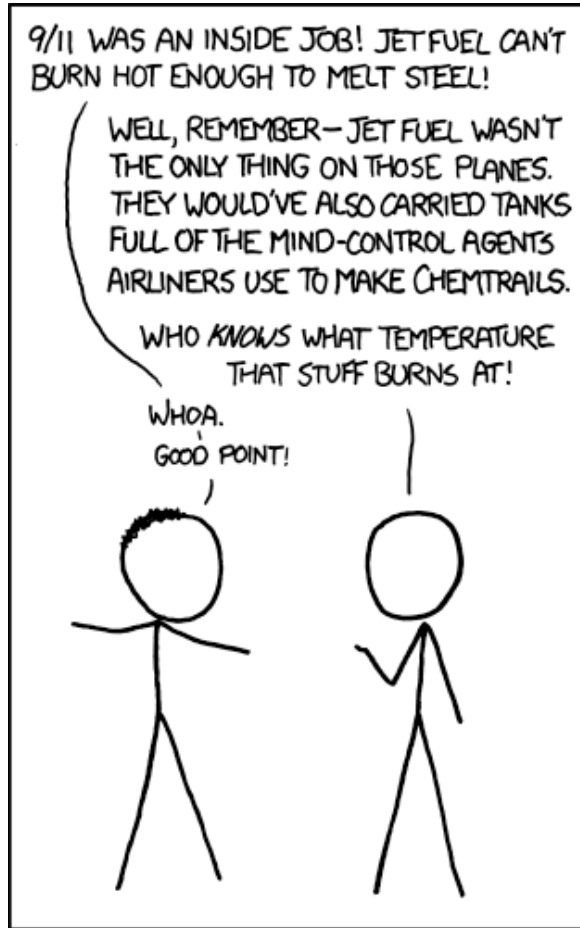
Polonium gained a level of notoriety as the poison used to kill Russian dissident Alexander Litvinenko.

The title text talks about power levels of the elements if each element had a controlling nation as per the TV show. Ununoctium (1-1-8-ium) was the placeholder

name for oganesson, the 118th element. It did not officially gain its permanent name until late 2016, 5 years after this comic was released. Oganesson, the heaviest element that has been created, has the shortest life before it decays into other elements, with a half-life of less than a millisecond. Xenon, a noble gas like oganesson, has few practical applications, but it is sometimes used in "neon" signs.

## #966: Jet Fuel

October 19, 2011



MY HOBBY: PLAYING CONSPIRACY THEORIES OFF AGAINST EACH OTHER.

The 'controlled demolition' theory was concocted by the government to distract us. '9/11 was an inside job' was an inside job!

## Explanation

This is another comic in the My Hobby series, where Randall talks about a strange hobby. This comic is a reference to the "9/11 Was An Inside Job" theory that the World Trade Center in New York City was blown up by a "controlled demolition". This is a fairly common argument that is seen on the internet.

Hairy's statement that "jet fuel can't burn hot enough to melt steel" references a common argument used by conspiracy theorists in references to the attacks. The official investigation concluded that the combination of the impact of the jets and the subsequent fire sufficiently compromised the structural steel beams of the towers that they lost integrity and collapsed. People who do not accept this conclusion frequently insist that the flame temperatures resulting from burning jet fuel is less than the melting point of steel, and so argue that the official explanation must be wrong, supporting their argument that the towers were deliberately brought down by explosives, planted by some conspiracy.

This argument has been frequently refuted by experts, on a number of grounds. No fuel has a single burning temperature, the temperature of any given flame depends on a number of factors, which can be hard to predict in uncontrolled situations. In addition, multiple fuels could have contributed to the fire, including not only the jet fuel but also flammables inside the building, and even metals (such as aluminum) that would have been

pulverized and dispersed by the impact. Importantly, it is not necessary for beams to melt in order to collapse a building. Metals lose much of their structural strength well below their melting point. If enough beams were sufficiently weakened, they would fail under the weight of the building, putting more pressure on the remaining beams, which would then be likely to fail, and so on.

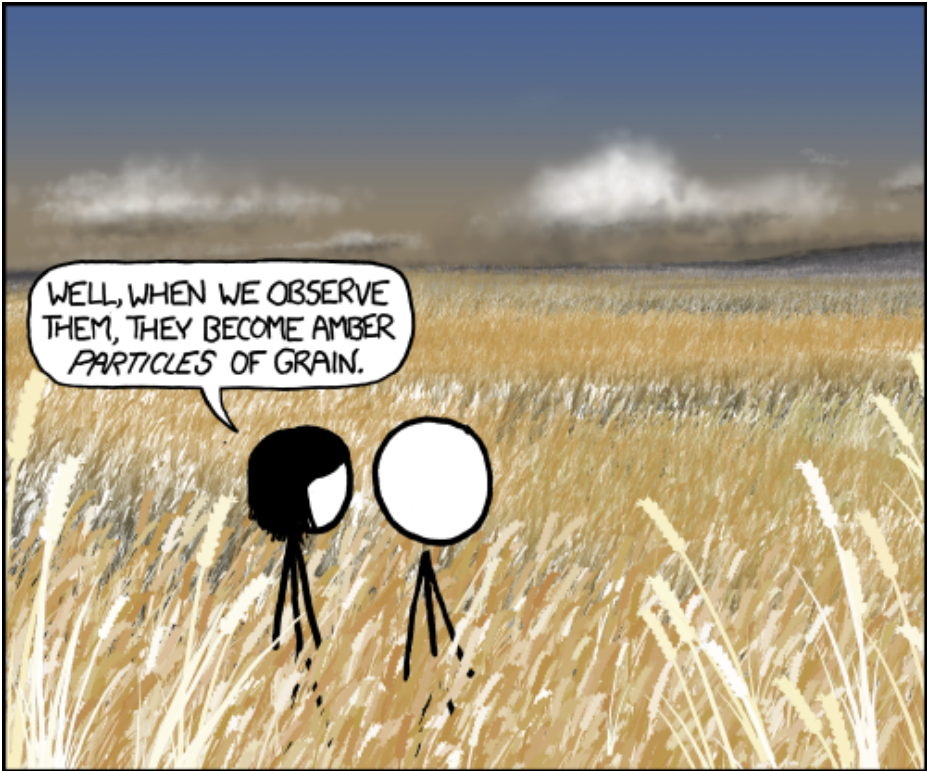
Cueball, however, doesn't argue with Hairy's premises, but instead tries a different tack, by appealing to a completely different conspiracy theory, concerning chemtrails. The Chemtrails conspiracy theory claims that the Contrails left behind aircraft contain mind-control agents planted by the US Government (or any other government, reptiloids, Freemasons, etc.), which are used to drug the population en masse. Cueball operates under the assumption that this theory is true, and points out that this means typical passenger jets would be equipped with containers of these chemicals, which could potentially burn at a high temperature. Because these chemicals are entirely hypothetical, no assumption about them can possibly be disproven. This puts Hairy in a position of either having to argue against the chemtrail conspiracy theory, while arguing for a 9/11 conspiracy theory or admit that there are factors he can't account for. In the comic, he goes with the latter course of action.

The title text is the natural "double down" on a theory which says that the conspiracy theory itself was concocted by the government and was supposed to distract from the truth, a parodic theory already seen in

South Park episode Mystery of the Urinal Deuce.

## #967: Prairie

October 21, 2011



Colorado is working to develop coherent amber waves, which would allow them to finally destroy Kansas and Nebraska with a devastating but majestic grain laser.

## Explanation

This comic refers to the song *America the Beautiful*, which contains the line "amber waves of grain," which refers to the plentiful wheat fields in the Midwestern US. The waves, in this context, are being likened to the waves in the ocean, as the wind can make the wheat move in such a way as to resemble waves.

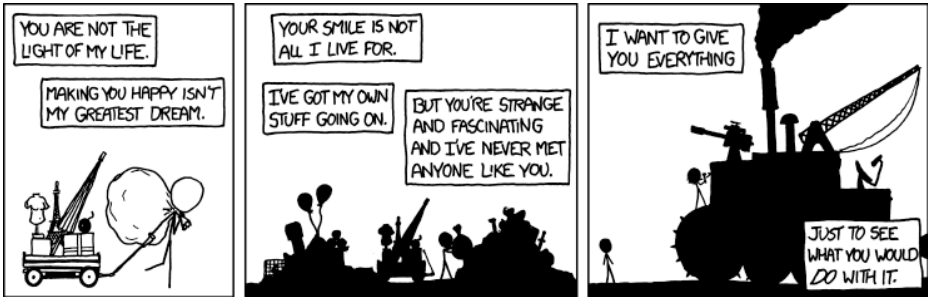
In quantum mechanics the wave-particle duality explains that particles can act like both particles and waves, depending on the context. Using a comedic adaptation of quantum theory, Megan states that the waves of grain become particles of grain when observed, which, in a way, is true. However, this is not a perfect analogy because each grain is a separate entity while an external force, the wind, is what produces the wave motion.

The title text builds on the quantum mechanics principle that a laser is a coherent wave. This leads to the absurd notion that one could harness waves in grain fields for use as a laser weapon, which would be used by one state to destroy two neighbors. There is a long running joke in the Rocky Mountain West of completely obliterating nearby states, and in particular Nebraska. The use of the word "majestic" to describe the laser is a reference to another line in *"America the Beautiful"* — "for purple mountain majesties" — which does in fact allude to the Rocky Mountains in Colorado.



## #968: Everything

October 24, 2011



I wanna hold your hand so I don't fall out of your gyrocopter.

## Explanation

In traditional western clichés of romance, men are expected to give women particular gifts (including flowers, candy and stuffed animals) and make declarations about how that woman is the sole focus of his life. This strip deliberately subverts those expectations by renouncing those sentiments and giving a decidedly non-traditional set of gifts, but making clear that this is a touching expression of love between these two parties.

Cueball is gathering a lot of different sorts of random things, including a parasol, a miniature Eiffel Tower, what appears to be a small round bomb with a short fuse and the bust of a mannequin. He adds these to an already immense pile of weird things including balloons and a cage with a bird.

While this happens Cueball narrates in short sentences. The first three are statements that at first seems similar to what you would find on a birthday or anniversary card from one person in a relationship to another, but in this case, all the statements ends up reversed. This can be interpreted as negative, neutral, or simply dismissing the idea that ones' romantic interests should be their sole focus in life.

- Normal sentence: You are the light of my life.
- Cueball's sentence: You are not the light of my life.
- Normal sentence: Making you happy is my greatest

dream.

- Cueball's sentence: Making you happy isn't my greatest dream.
- Normal sentence: Your smile is all I live for.
- Cueball's sentence: Your smile is not all I live for.

The fourth sentence emphasizes this, but Cueball then says that he does appreciate how this person is "strange and fascinating" like no one else he's ever met.

It turns out to be Megan he is talking about who is shown applying a hammer to the front of a large and strange vehicle while standing on one of its huge wheels. She seems to have built this giant super tank/machine from anything Cueball supplies her with, having several huge pigged wheels, a mounted gun, satellite dish, a crane and smoke coming out of an exhaust pipe at the top, implying it is already running. But Cueball is very fascinated by her strangeness.

Cueball's final statement changes the meaning of the cliched sentiment I want to give you everything. Instead of out of blind devotion, he wishes to give Megan the world just to see what kinds of things she would create (like the contraption shown in the final panel).

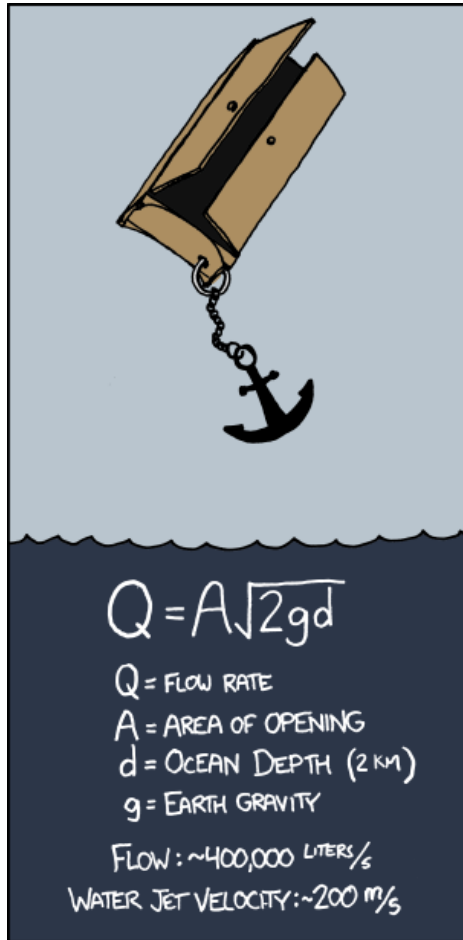
Some of the objects in the piles in the second panel can easily be determined, like the two balloons. But most others are more difficult to recognize. To the left there is what appears to be a cage with an animal inside, could be a bird. To the right there appears to be the hilt of a sword

(maybe stuck in a stone, see 1521: Sword in the Stone). Finally the tall thin thing sticking out of the top left of the right pile could be the stuffed giraffe from 604: Qwertial Aphasia. There are other distinct things, like the tall "cylinder" and the three "cannonballs" in a pyramid pile to the left, and something with a peculiar shape between the "giraffe" and the sword hilt. But it seems impossible to determine what they are.

The title text similarly starts with the conventional Beatles love song "I Want to Hold Your Hand", but only in order to not fall out of a gyrocopter. A gyrocopter is a flying machine that has a rotor like a helicopter, but the rotor is not powered by a motor. Rather, the motor of the gyrocopter drives a propeller that accelerates the machine forward, while the air rushing past the rotor drives the rotor like a helicopter during autorotation. It is normally a comparatively safe kind of aircraft (unless you fly it strictly like you would a plane, but this may not account for aerobatics done in it, and possibly the lack of seatbelts (or passenger seats)).

## #969: Delta-P

October 26, 2011



THE WHITE WITCH DIDN'T  
KNOW WHAT HIT HER.

If you fire a Portal gun through the door of the wardrobe, space and time knot together, which leads to a frustrated Aslan trying to impart Christian morality to the Space sphere.

## Explanation

The Lion, the Witch and the Wardrobe is a book in which four children accidentally wander into a world known as Narnia through a wardrobe that only allows passage through to Narnia when you aren't looking for it. In the comic, someone connects an anchor to the wardrobe and throws it into the ocean. The formula describes the flow of water through the open doors when the wardrobe sits at the bottom of the ocean in 2 km depth, which means that a steady stream of water at an approximate velocity of 200 meters per second will flow into Narnia.

The evil White Witch, who has made it "always winter, and never Christmas," could not have anticipated that a wardrobe portal would suddenly begin spewing approximately 400,000 liters of water per second into Narnia.[citation needed]

Sea water freezes at low temperatures and flowing water freezes at even lower temperatures, depending how fast it is going. Water jetting out from this portal would be flowing very quickly indeed, approximately 200 meters per second (450 mph or 720 km/h) as the comic says; this is over half the speed of sound.

This water would not freeze. First it would devastate any forest trees or iron lamp posts in front of it until it eventually slowed down and fell to the ground, creating a rapidly expanding river of sea water. Narnia would not

stay frozen for long, as snow would melt, ice would break apart and the valley would quickly flood.

Delta-P is a mathematical term for the difference in pressure. The Hagen–Poiseuille equation which can be applied to a flowing liquid in a long cylindrical pipe results in an unphysically high flow rate because the opening is rectangular and too short for a laminar flow. However, one can use Bernoulli's principle to bound the flow velocity, even in the case of turbulent flow. The maximum flow rate is given by:

From the hydrostatics of water the pressure difference depends on gravity and the height:

Putting this together and changing the cross-sectional area to a rectangular area we get the formula used by Randall:

Assuming the wardrobe is two meter high and one in width ( $A = 2 \text{ m}^2$ ) and using the gravitational constant  $g = 9.81 \text{ m/s}^2$  the flow rate is  $396 \text{ m}^3$  per second, or 396,000 liters per second.

The water jet velocity  $v$  is based on Torricelli's law:

It gives  $198 \text{ m/s}$  in this scenario.

The title text references the video game Portal in which you solve puzzles using a gun which projects portals onto certain surfaces. In the game you cannot shoot a portal through a portal, but Randall says that if you try to create a portal with the portal gun through the wardrobe,

space and time knot together. C. S. Lewis's *The Chronicles of Narnia* series (like most of his writing) is influenced by his views on Christianity and morality (he did not set out to write a "Christian story", but later accepted that there are many parallels between the *Chronicles* and his faith), with Aslan the lion representing Jesus Christ. As such, Aslan often provides lessons and advice on morality and faith to the main characters; however, the Space Sphere (a minor character in the game *Portal 2*) is a barely-sentient AI whose only preoccupation is going to space, and it would not be receptive to Aslan's teachings. The Space Sphere might be more interested in Lewis's *The Space Trilogy*, a trilogy of science-fiction books in which the main character travels through space and learns that the divine struggles between good and evil on Earth are also reflected elsewhere in the solar system.

### **Trivia[edit]**

- In the dark fantasy light novel series *Goblin Slayer* (and its anime adaptation), the titular main character uses a portal scroll keyed to the bottom of the ocean to slay a powerful ogre with a water jet as described here.



## #970: The Important Field

October 28, 2011



I hear in some places, you need one form of ID to buy a gun, but two to pay for it by check. It's interesting who has what incentives to care about what mistakes.

## Explanation

In this comic, a person wearing a green cap with a black emblem on the front is using their computer to access an online web interface to launch a missile at a target. The joke is that even though the interface only asks them to enter the target coordinates once, it asks for their email address twice, even though the coordinates are by far the more important detail to get right, since launching the missile at the wrong target could result in a disastrous unintended loss of life or property damage.

It is common for online interfaces to force users to type certain details twice, as a form of redundancy checking to ensure that the user really has entered the correct details and hasn't made an error. Some forms even go the extra step of preventing the user from copy-pasting into the second field, which would render it useless as a redundancy check.

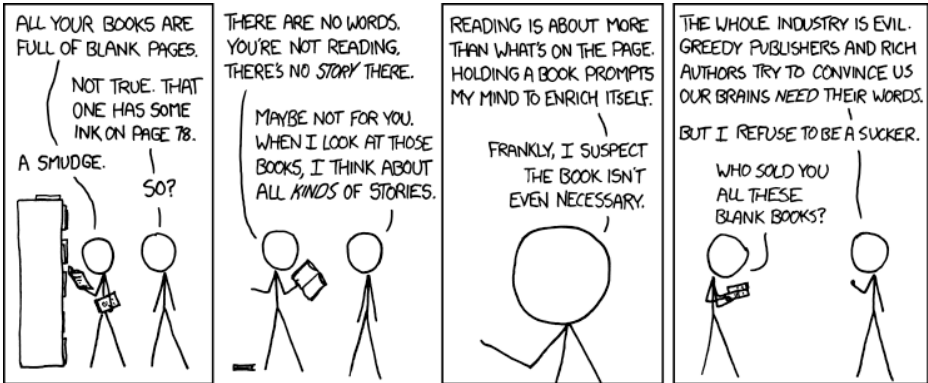
This is usually done for email addresses and when creating new passwords, which are used to identify and authenticate users, and are therefore important to get right.

In the title text, Randall suggests that the presence of redundancy checks can give you an interesting insight into what things people deem to be important. He gives a (supposed) real-life example of a merchant that requires only one form of ID in order to buy a gun, but two forms if you want to pay for it by check - suggesting that

the seller is more worried about the safety of their money than the potential danger of giving a lethal weapon to someone untrustworthy.

## #971: Alternative Literature

October 31, 2011



I just noticed CVS has started stocking homeopathic pills on the same shelves with--and labeled similarly to--their actual medicine. Telling someone who trusts you that you're giving them medicine, when you know you're not, because you want their money, isn't just lying--it's like an example you'd make up if you had to illustrate for a child why lying is wrong.

## Explanation

While the comic is funny on its own in a "Wake Up, Sheeple" kind of way, the title text reveals that the comic is a parable about homeopathy. The comic title is a play on alternative medicine.

In the comic, it is implied that Cueball has been scammed into buying blank books, though he attempts to defend it as a valid choice (ironically, he thinks that it is the other people who are being scammed, not he). The title text likens this to the CVS Pharmacy selling homeopathic pills using methods that does not clearly distinguish them from real pharmaceuticals. Homeopathy is a pseudoscience based on the idea that a substance that causes the symptoms of a disease in healthy people will cure that disease in sick people if administered in sufficiently small doses. It is possible that Cueball actually bought blank notebooks and is scamming himself into believing he made a valid and logical choice.

Homeopathic remedies are prepared by repeatedly diluting a substance with alcohol or water. Somewhat counter-intuitively, homeopathy considers the weakest dilutions to have the most powerful healing effect. Frequently, in fact, the dilutions are repeated past the point where any number of molecules of the "active ingredient" can remain.

Selling a homeopathic remedy as actual medicine when it

is just water is analogous to selling blank books. The smudge of ink Cueball mentions in the comic may be referencing the fact that some of the less diluted homeopathic remedies can contain a tiny amount of the original substance.

Five years after this comic was published, the Center for Inquiry (CFI) filed lawsuits against CVS in 2018 and Walmart in 2019 "to try to boot homeopathic products from pharmacy aisles for good. CFI claimed that deceptive placement of the water-based products violated the District of Columbia Consumer Protection Procedures Act (CPPA)". Three/four years later, the District of Columbia Court of Appeals ruled on September 29, 2022 that these lawsuits have merit and may move forward.

## #972: November

*November 02, 2011*



November marks the birthday of Charles Schulz, pioneer of tongue awareness.

## Explanation

This comic is a homage to Charles Schulz, the creator of the comic Peanuts, who was born on November 26, 1922. Both comics carry the idea that when you start thinking about your tongue, you can hardly stop thinking about it. (Similarly: if you start thinking about your breathing, you stop breathing unless you consciously think to breathe, same goes for blinking.) This is similar to the ironic process theory, where trying to not think about something will invariably make you think about it. The intention of Black Hat in this comic is for Cueball to consciously feel his tongue for the entire month of November. Since it was Black Hat's idea, Black Hat probably suffers the same consequences.

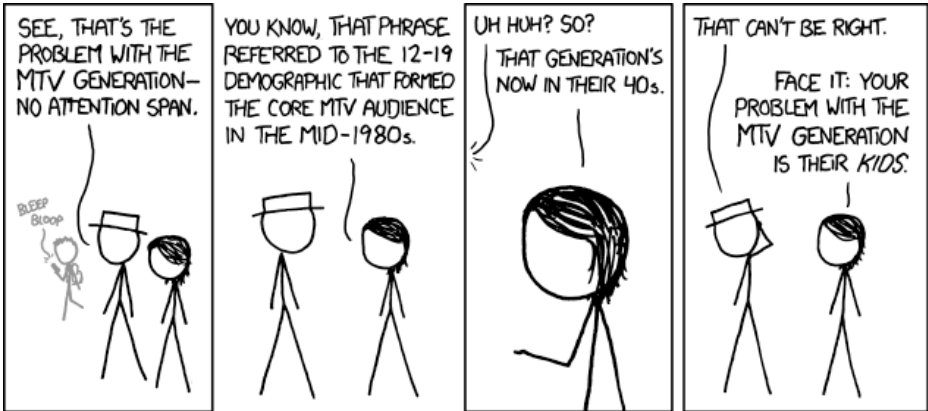
This is similar, in concept, to the expression and phrase used for trolling in online communities, "You Are Now Breathing Manually".

The line "you are now aware of your tongue" was mentioned much later in the title text of 2563: Throat and Nasal Passages. Here it was throat and nasal passages awareness which was the subject, due to the, at that time, two year long 2020 COVID-19 pandemic.



## #973: MTV Generation

*November 04, 2011*



If you identified with the kids from *The Breakfast Club* when it came out, you're now much closer to the age of Principal Vernon.

## Explanation

MTV stands for "Music Television", which is the name of a US-based cable channel, founded in 1981, specifically focusing on popular music and the music industry in general. The programming largely (though not exclusively) consisted of music videos. The focus of the channel has since shifted to reality shows. In the channel's heyday in the 1980's and early 1990's, it was popular with teenagers and young adults. As is often the case with youth culture, it was roundly condemned by some adults as being destructive and pointless. One of the specific criticisms was that the format of short videos, with quick-edit, highly kinetic visual styles and no underlying narrative was destroying the attention span of the youth.

Despite MTV no longer being especially popular (and no longer focusing on music videos), people still use the term MTV Generation to refer to the young cohort, and insist that they have poor attention spans, resulting from their media exposure. Megan explains that the term really originated about 25 years ago, to describe Generation X, the generation born from 1965 to 1980. The actual MTV generation has long since grown up, and most young people today either don't watch MTV, or have no idea that it was originally a music channel. Teenagers today are the children of "the MTV generation" (and even their grandchildren, in some cases).

The Breakfast Club is an iconic movie from 1985 in

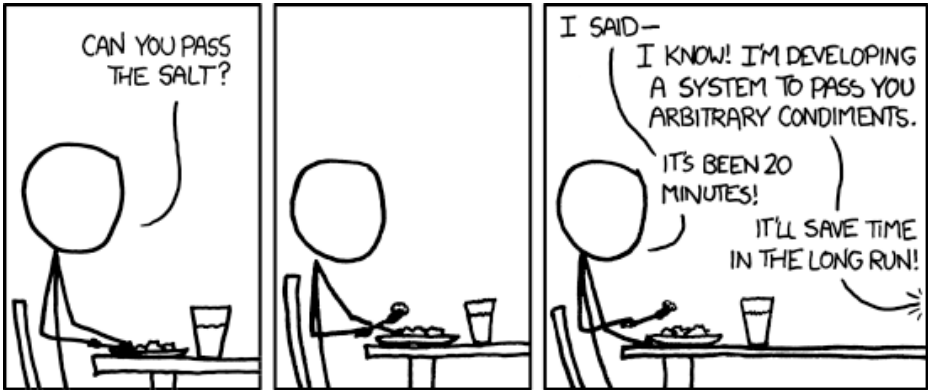
which 5 teenagers spend a Saturday detention together at school. Principal Vernon was the overseer of the detention, and a symbol of authority and oppression of youth - the actor playing principal Vernon was around 45 years old at the time of filming. The irony is that many adults who grew up watching the movie still identify with the teenagers, but now have little in common with them.

There are a couple of themes in this strip that Randall has covered before. One is mocking adults for the assumptions they make about young people, youth culture and new technology. Adults have a tendency to whitewash the past, and insist that modern young people are being corrupted by new trends. And when that generation of youth grows up, they tend to make the same assumptions about the next generation. 1601: Isolation, 1227: The Pace of Modern Life, 1414: Writing Skills, 1348: Before the Internet

Another theme is making people feel old by pointing out how long ago their common memories are, as in 647: Scary, 891: Movie Ages, 1393: Timeghost, 1477: Star Wars, and 2165: Millennials.

## #974: The General Problem

*November 07, 2011*



I find that when someone's taking time to do something right in the present, they're a perfectionist with no ability to prioritize, whereas when someone took time to do something right in the past, they're a master artisan of great foresight.

## Explanation

In this comic, Cueball asks a friend or relative to pass him the salt, a common request when dining with others. Usually it is expected that the person will simply pass the salt immediately; however, the offscreen person doesn't get back to him until 20 minutes later, when Cueball repeats his request. The friend explains that they're attempting to solve the general problem of passing any table condiment (which salt is not; in culinary terms, it is a seasoning. Condiments are liquid-based complements, such as ketchups, mustards, relishes & chutneys), not just salt.

This is a common mistake made in software development, wherein a developer tries to solve a problem far more general than the specific one they have been tasked to solve.[citation needed] Sometimes, this foresight can be useful, if the developer has predicted use cases that later turn out to be needed; other times, it can lead to wasted time, or worse, overengineering, where a system is made more complex and fragile than it needed to be, instead of robustly solving a single, well-defined problem.

It isn't clear what exactly the offscreen friend is doing (or even what they could do) to solve the general condiment-passing problem; most likely they are still in the design stage of their solution and have not even started implementing it, much to Cueball's chagrin. Nonetheless they are convinced that it is worth taking

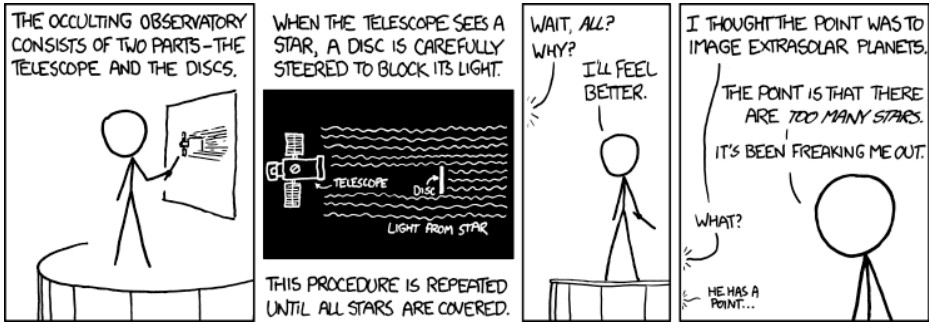
the time to do this now due to the potential time-saving in the long run. In doing so, they are overlooking the more salient and saline facts of the situation; namely, that passing condiments is not something that requires a solution or takes up any significant amount of time, and that Cueball would probably prefer to have the salt while his meal is still warm.

In the title text, Randall notes a social paradox: that people tend to be disparaging of such inefficient time-wasting while it's not producing any results, but will heap praise on it when they're able to reap the benefits of that foresight.

See also 137: Dreams, 1205: Is It Worth the Time?, 1319: Automation, 1691: Optimization, 2752: Salt Dome and the Time management category.

## #975: Occulting Telescope

November 09, 2011



Type II Kardashev civilizations eventually completely enclose their planetary system in a Dyson sphere because space is way too big to look at all the time.

## Explanation

Cueball takes the useful practice of occulting stars beyond its intended purpose. Occulting is used in astronomy to block the light from a star under observation so that adjacent dim objects, such as any surrounding extrasolar planets, might be more easily detected and examined. This refers to a proposed starshade mission, envisioned for space telescopes like the James Webb Space Telescope, in which a large occulter would fly in formation with that telescope.

Instead of blocking the light of a single star for the purposes of observation, Cueball proposes blocking the light from all stars, for the purpose of making him feel comfortable with the night sky. Cueball feels, some might say irrationally, that "there are too many stars", and "it's been freaking me out". This may be a reference to Isaac Asimov's "Nightfall" which explores in depth the psychological implications by which stars make some people feel small and insignificant because they demonstrate just how vast is the universe.

The title text refers to both a Type II Kardashev civilization and a Dyson sphere.

A Dyson sphere is a theoretical construction consisting of a network of satellites that orbit and completely surround a star. The purpose of a Dyson Sphere is to capture and transmit all of the available solar energy in the star back to a planet.



A Type II Kardashev civilization is a theoretical civilization that has advanced to the point where it has harnessed all the energy radiated by its own star (for example, the stage of successful construction of a Dyson sphere).

For comparison purposes:

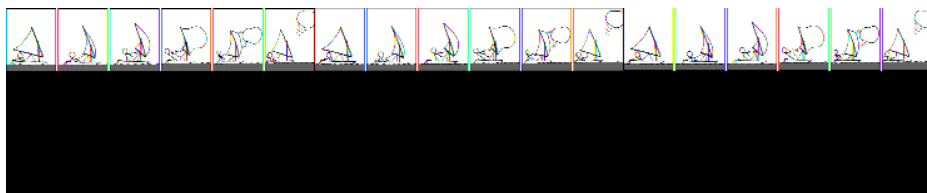
- A Type I Kardashev civilization is one that has harnessed the energy of their entire planet.
- A Type III Kardashev civilization is one that has harnessed the energy of their entire galaxy.
- We are currently less than I.

The title text reveals that Type II Kardashev civilizations construct Dyson spheres not for the purposes of capturing all solar energy, but merely to block the view of all that hideous space. This may allude to Douglas Adam's *Hitchhiker's Guide to the Galaxy* novel series, where a planet called Krikkit is completely obscured by a dust layer. Upon building a spacecraft to explore what lies behind that dust cover, they decide to destroy all living beings in the rest of the universe. See <http://hitchhikers.wikia.com/wiki/Krikkit>.

The concept of an occulting space telescope was visited again in 1730: *Starshade*, and the idea of the vastness of space being frightening was revisited in 2596: *Galaxies*.

## #976: Sail

*November 11, 2011*



It only works a few times before you have to capsize the boat in a soap lagoon again.

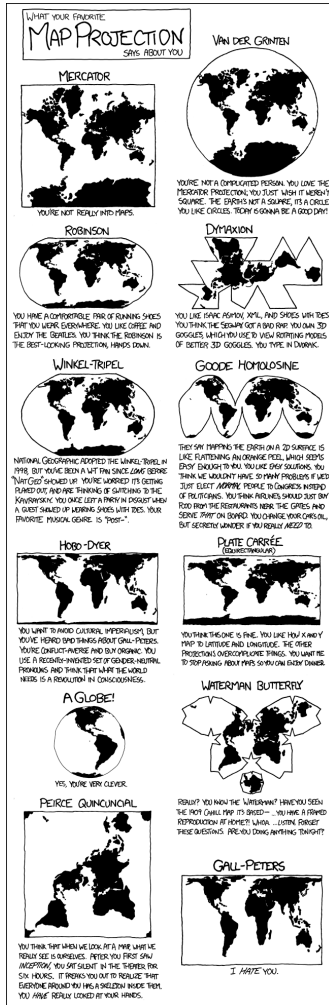
## **Explanation**

A billowing sail sometimes looks like the first stage of blowing a bubble. Cueball is clearly surprised when a bubble is actually formed by the filled sail.

Readers infer from the title text that the water is also part of this fantastical scenario. If the boat was overturned (capsized) in a soap lagoon, a film would form between the mast and the boom (horizontal bar that adjusts the sail). The film would become like the sail in the comic, filling with air and forming bubbles until the film is used up.

# #977: Map Projections

November 14, 2011



What's that? You think I don't like the Peters map because I'm uncomfortable with having my cultural assumptions challenged? Are you sure you're not ... ::puts on sunglasses:: ... projecting?

## Explanation

Map projection, or how to represent the spherical Earth surface onto a flat support (paper, screen...) to have a usable map, is a long-time issue with very practical aspects (navigation, geographical shapes and masses visualization, etc.) as well as very scientific/mathematical ones, involving geometry or even abstract algebra among other things. There is no universal solution to this problem: Any 2D map projection will always distort in a way the spherical reality. Many projections have been proposed in various contexts, each intending to minimize distortions for specific uses (for nautical navigation, for aerial navigation, for landmass size comparisons, etc.) but having drawbacks from other points of view. Some of them are more frequently used than others in mass media and therefore more well-known than others, some are purely historical and now deprecated, some are very obscure, etc.

Randall suggests here the idea that someone's "favorite" map projection can reveal aspects of their personality, then goes through a series of them to show what they can mean.

He may actually believe that all map projections are in a way bad. This could be inferred from the fact that he much later began publishing a series of Bad Map Projections.

An animated version of this comic, showing how the

projections look when they are rotated, was uploaded [here](#).

## **Mercator[edit]**

The Mercator projection was introduced by Flemish cartographer Gerardus Mercator in 1569. The main purpose of this map is to preserve compass bearings; for example 13 degrees east of north will be 13 degrees clockwise from the ray pointing toward the top of the map, at every point. A mathematical consequence is the mapping is conformal, i.e. if two roads meet at a certain angle on the surface of the Earth, they will meet at that same angle on the map. It also follows that at every point the vertical and horizontal scales are the same, so locally i.e. considering only a small part of the map, geographical features (shapes, angles) are well represented, which helps a lot in recognizing them on-the-field, or for local navigation in that small part only. For this reason, that projection (or a close variant) is used in several online mapping services (such as Google Maps), which means that it is frequently encountered by the general public. A straight line on the map corresponds to a course of constant bearing (direction), which was very useful for nautical navigation in the past (and thus made that projection very well-known).

However, from a global point of view, this projection is radically incorrect in how it shows the size of landmasses (for instance, Antarctica and Greenland seem gigantic), and furthermore, it always excludes a small region around each pole (otherwise the map would be of infinite height[citation needed]), so it doesn't provide a complete solution for the problem of map projection. The comic implies that people who like that projection aren't very interested with map issues, and typically use what they are offered

without thinking much about it.

### **Van der Grinten[edit]**

The Van der Grinten projection is not much better than the Mercator. It was adopted by National Geographic in 1922 and was used until they updated to the Robinson projection in 1988.

The Van der Grinten projection is circular as opposed to the Mercator projection. The fictional person believes a circular map is more fitting to the real Earth's three-dimensional spherical nature because both are round. This belief fails to recognize that a two-dimensional circle has very little in common with the surface of a sphere, and thus this projection still causes a vast distortion of space and area. Because of this, Randall implies the Van der Grinten enthusiast to be optimistic and childishly simple-minded (e.g. "you like circles").

### **Robinson[edit]**

The Robinson projection was developed by Arthur H. Robinson as a map that was supposed to look nice and is often used for classroom maps. National Geographic switched to this projection in 1988, and used it for ten years, switching to the Winkel-Tripel in 1998.

The Beatles was a rock band that enjoyed great commercial success in the 1960s, and are widely considered the best act ever in the genre of popular music. The Beatles, coffee, and running shoes are all things that are very commonly enjoyed and largely uncontroversial, as well as being comforting. Liking these specific things suggests an ordinary, easygoing lifestyle paralleled by the projection.

## Dymaxion[edit]

Also called the Fuller Map, the Dymaxion map takes a sphere and projects it onto an icosahedron, that is a polyhedron with 20 triangular faces. It is far easier to unwrap an icosahedron than it is to unwrap a sphere into a 2D object and has very little skewing of the poles. Buckminster Fuller was an eccentric futurist who believed, for example, that world maps should allow no conception of "up" or "down". He was therefore more than happy to defy people's expectations about maps in the pursuit of mathematical accuracy.

Randall associates the projection to geek subculture and niche markets:

- Isaac Asimov was an American science-fiction writer, who (as well as publishing many textbooks) is considered the father of the modern concept of robots. He invented the Three Laws of Robotics. He also worked on more than 500 books throughout his career.
- XML is the eXtensible Markup Language. It is used to represent data in a format that machines can read and understand, as well as being human-readable. In practice, XML is cumbersome to read.
- Toed shoes are a favorite of Randall's to pick on. In society they are seen as a geek clothing item.
- Brought to the world by Dean Kamen, the Segway PT was supposed to be a device that changed the way cities were built. In practice, it had the same problems as other novel personal transporters, such as the Sinclair C5 many years earlier. Small, powered vehicles didn't fit neatly into the existing infrastructure



for cars, bikes or pedestrians; using them on roads or sidewalks could be unsafe, illegal or both. Early versions of the Segway also cost more than a used car, such that they were never widespread enough to provoke legal or infrastructure changes. The devices found a small niche among law enforcement, mall/airport security and tour operators, rather than private owners. The former owner of Segway Inc., the late Jimi Heselden, accidentally rode his Segway off a cliff in 2010. Ninebot, then owner of the Segway brand, announced in 2020 that the flagship 2-wheeled self-balancing vehicle would be discontinued.

- At the time of comic release, 3D goggles, nowadays widely known as VR headsets, were considered a gimmick at best. The original idea is as old as 3D graphics, but it never really took off until mid-2010s. Earlier products were very unwieldy and offered poor graphics quality, so no one took this technology seriously.
- Dvorak is an alternate keyboard layout to QWERTY. According to legend, QWERTY was invented to help keep manual typewriters from jamming (by placing the most used keys far from each other) but Dr. August Dvorak performed many studies and found the mathematically optimal keyboard layout to reduce finger travel for right handed typists. While some claim Dvorak is technically better than QWERTY, QWERTY had become the standard. Most keyboards were laid out in QWERTY format, but a lot of software exists to remap the keys to DVORAK for those interested in typing faster. Retraining the brain to use Dvorak takes perhaps a week. It has become a recurrent theme on xkcd.

**Winkel-Tripel[edit]**

Proposed by Oswald Winkel in 1921, the Winkel tripel projection tried to reduce a set of three (German: Tripel) main problems with map projections: area, direction, and distance. The Kavrayskiy projection is very similar to the Winkel Tripel and was used by the USSR, but very few in the Western world know of it.

The comic links this projection to hipster subculture. The hipster stereotype is to avoid conforming to mainstream fashions. "Post-" refers to a variety of musical genres such as post-punk, post-hardcore, post-minimalism, post-rock, etc. that branch off of other genres, and are generally considered less accessible than the genres that spawned them. Liking a genre just called "post-" implies that the listener prefers music that is less mainstream, and may have that as the only criterion for listening.

- In German "Winkel-Tripel-Projektion" means Winkel's triple projection, and therefore the hyphen shouldn't be there: "Winkel Tripel" or "Winkel tripel".
- This projection was later used in 2242: Ground vs Air.

## **Goode Homolosine[edit]**

The Goode homolosine projection takes a different approach to skewing a sphere into a roughly circular surface. An orange peel can be taken from an orange and flattened with fair success; this is roughly the procedure that John Paul Goode followed in creating this projection. Randall is suggesting that people who like this map also prefer relatively easy solutions to other things in life, despite those solutions having nuanced problems that are more difficult to address.

People often make arguments that if normal people ran the United States, then the US wouldn't be in the trouble it is. This is

from the belief that career politicians are simply out to make money and will only act in the interest of their constituency when their continued easy life is threatened (usually around election time). While some form of this view is very common and probably pretty much correct, Randall is saying that someone who likes this map may take this to extremes.

Airline food is another, much maligned, problem. How do you store enough food to feed people on long airplane trips? What kind of food can be served in an enclosed, low-air-pressure environment? The common solution is to use some kind of prepackaged, reheated meal. Randall is saying that the people in favor of the Goode Homolosine wonder why the airlines don't simply order meals from the restaurants in the airport, store that food, and serve it, rather than using bland reheated food. However, this seemingly-obvious solution ignores how being in an airplane dulls your sense of taste. Airplane food is actually over seasoned for eating on the ground, meaning that if airlines switched to restaurant food it would probably taste even blander. There would also be issues with acquiring special meals (for example, vegetarian, Kosher, and Halal meals), especially if suitable restaurants were not in close range to the airport. Airport restaurants tend to also be more expensive than usual.

Older cars burned oil like mad fiends, and oil back then would become corrosive to the innards of an engine, so oil had to be changed often. But, with the introduction of synthetic motor oil and better designed engines, new cars only need their oil changed about every 10,000 to 15,000 miles. A common conspiracy theory is that modern automobile oil manufacturers still recommend that car owners change their oil every 3,000-5,000 miles to "drum" up more business, even though that frequency is unnecessary.

All of these references suggest that people who like the Goode Homolosine projection are fans of simple solutions to problems. However, while the solutions appear to be an easy, common-sense solutions, they all rely on over-simplifying the problem, and ignoring any problems introduced by the solution itself. For instance: the restaurants might have trouble making enough food for the whole plane, and it could get cold before being served; the air conditions aboard planes can affect taste, so airlines say they optimize for this; there is no such thing as a "normal" person, and if there were, they would have less political experience than politicians, while remaining subject to the same pressures and problems with the larger political system; and the Goode Homolosine projection, while mostly resembling a flattened orange peel as suggested by the earlier analogy, does indeed cut down on distortion, but also has serious problems of its own, such as leaving huge gaps of nothingness between the continents, making distances across the oceans difficult to visualize, and splitting Greenland in half.

## **Hobo–Dyer[edit]**

The Hobo–Dyer projection was commissioned by Bob Abramms and Howard Bronstein and was drafted by Mick Dyer in 2002. It is a modified Behrmann projection. The goal was to be a more visually pleasing version of the Gall–Peters.

As is discussed in the Gall–Peters explanation, the Gall–Peters was developed to be equal area, so that historically colonised and economically disadvantaged areas nearer the equator are not diminished in area by the map projection, nor 'global north' areas enlarged.

Randall associates the Hobo–Dyer projection to "crunchy granola" — a stereotype associated with vegetarianism, environmental activism, anti-war activism, liberal political leanings, and some traces of hippie culture.

With feminism becoming mainstream and non-binary genders being more widely accepted, some have begun to invent gender-neutral pronouns so that when referring to a person whose gender is not known they cannot be offended by being referred to by the wrong pronouns. In Middle English 'they' and 'their' were accepted genderless pronouns that could replace 'he', 'she' as well as be used to represent a crowd, but this usage is considered by some to be grammatically incorrect because of the plural/singular debate (stupid Victorian Grammarians!). There have been many attempts at popularizing invented gender-neutral pronouns and they are beginning to achieve some degree of success in the mainstream.

## **Plate Carrée[edit]**

Also known as the Equirectangular projection, it has apparently been in use since approximately 100 CE. The benefit of this projection is that latitude and longitude can be used as x,y coordinates. This makes it especially easy for computers to graph data on top of it.

According to the comic, the projection appeals to people who find much beauty in simplicity.

## **A Globe![edit]**

In any good discussion there has to be at least one smart-ass.[citation needed] This is a comic about map projections,

that is, the science of taking a sphere and flattening it into 2 dimensions. The smart-ass believes that we shouldn't even try: a sphere is, tautologically, the perfect representation of a sphere.

To quote *The Princess Bride*: "Yes, you're very smart. Shut up."

A globe is the "map projection" used by Google Earth when zoomed out.

Notably, what is depicted in the panel itself (the comic being 2D) is technically an orthographic map projection.

### **Waterman butterfly[edit]**

Similar to the Dymaxion, the Waterman butterfly projection turns a sphere into an octahedron, and then unfolds the net of the octahedron, which was devised by mathematician Steve Waterman based upon the work of Bernard J.S. Cahill.

Bernard Cahill published a butterfly map in 1909. Steve Waterman probably has the only extant "ready to go" map following the same general principles, though Gene Keys may not be far behind. Waterman has a poem with graphics in a similar vein to this xkcd comic that is worth reading.

Polyhedral projections like Cahill, Dymaxion or Waterman typically offer better accuracy of size, shape and area than flat projections, at the expense of compass directionality, connectedness, and other complications.

The joke is that the person responding deeply understands map projections; anyone who knows of this projection is a person that Randall would like to get to know.

## **Peirce quincuncial[edit]**

The Peirce quincuncial projection was devised by Charles Sanders Peirce in 1879 and uses complex analysis to make a conformal mapping of the Earth, that conforms except for four points which would make up the midpoints of sides and lie on equator (the equator is represented by a square and the corners connect the sides in the middle.)

Inception was a 2010 movie about meta lucid dreaming. It has a complex story that is difficult to follow and leaves the viewer with many questions at the end, and almost always needs to be watched multiple times to be understood.

The human brain is not well developed to deal with oddly obvious things. One example is that everyone has a skeleton, but everyone is surprised to see a part of their body represented by an X-ray. Another is the fascinating complexity of the human hand, a machine which is amazingly complex, driven by a complex interplay of electrical and chemical signals; yet is the size of the hand and so useful. A fascination with or fixation on such thoughts is often associated with an altered state of mind brought on by marijuana consumption. Therefore, Randall may be implying that this map would appeal to stoners.

## **Gall–Peters[edit]**

The Gall–Peters projection is mired in controversy, surprisingly for a map projection. James Gall, a 19th-century clergyman, presented this projection in 1855 before the British Association for the Advancement of Science. In 1967, the filmmaker Arno Peters created the same projection and presented it to the world as a "new invention" that put poorer, less powerful countries into

their rightful proportions, (as opposed to the Mercator) during the US civil rights movement, when society was very concerned about social justice. Peters played the marketing game and got quite a few followers of his map by saying it had "absolute angle conformality," "no extreme distortions of form," and was "totally distance-factual". These claims were in fact false. The Mercator projection distorts size in favor of shape, and Gall-Peters distorts shape in favor of size, being especially inaccurate at the equator and the poles.

Anyone who loves such a politically charged map that has become popular by way of marketing stunts and false claims, Randall would rather not have anything to do with. Alternatively Randall just dislikes this map projection so much due to the above mentioned major inaccuracies, that he hates anyone who likes it.

## **Title text[edit]**

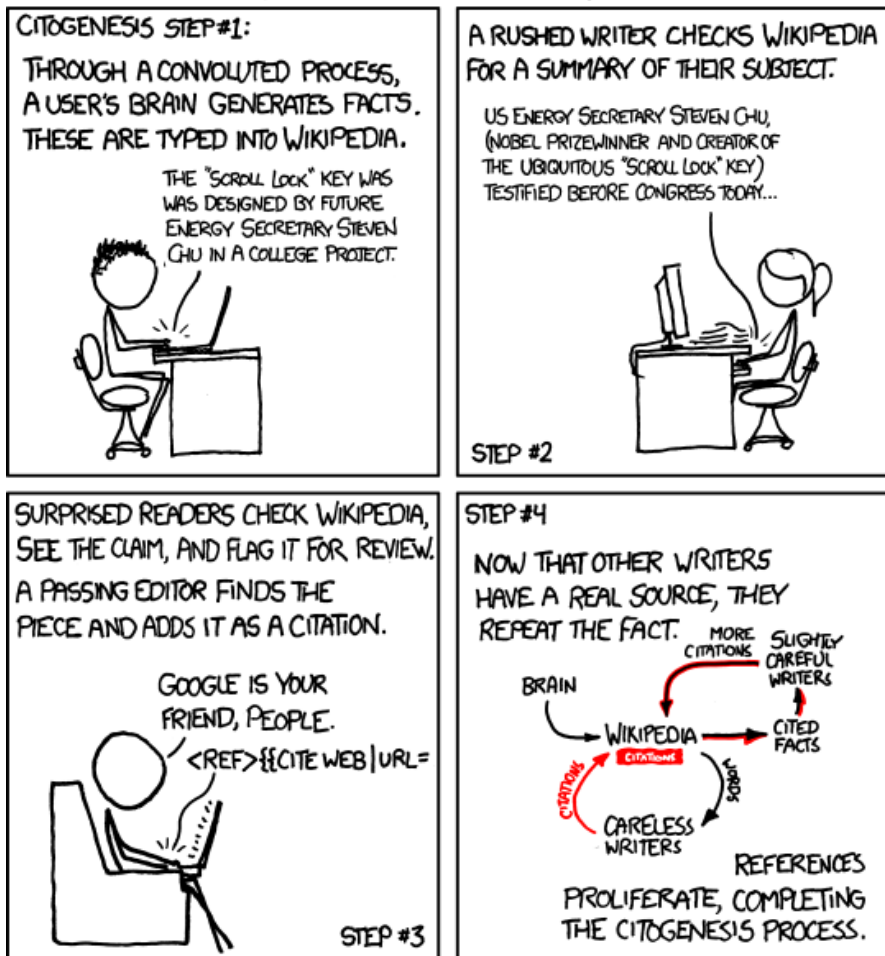
The title text makes a joke that references a meme from CSI: Miami, in which the star, David Caruso, starts a sentence, then puts on his sunglasses and ends the sentence with a corny pun. In this case, the pun is on map projection and projection in psychology. Psychological projection is an unconscious defense mechanism wherein a person who is uncomfortable with their own impulses denies having them and attributes them to other people, and blames these people for these impulses. The Sunglasses internet meme has been used in other comics as well.



## #978: Citogenesis

November 16, 2011

### WHERE CITATIONS COME FROM:



I just read a pop-science book by a respected author. One chapter, and much of the thesis, was based around wildly inaccurate data which traced back to ... Wikipedia. To encourage people to be on their toes, I'm not going to say

what book or author.

## Explanation

This comic is calling into question the reliability of Wikipedia. This is a favorite pastime of librarians, teachers, and professional researchers, and not usually one of Randall's. Wikipedia is a free and freely editable encyclopedia that aims to become a comprehensive, neutral compilation of verifiable and established facts. Wikipedia aims to provide only facts backed by reliable sources. However, this comic strip details a process in which Wikipedia can not only spread misinformation but make said misinformation seem reliable through a process of "circular reporting".

The title of the comic is similar to the word cytogenesis. Cytogenesis is the formation of cells and their development. Citogenesis, on the other hand, is a portmanteau of 'Citation' and 'Genesis'. A citation is a reference to a source, used to back up a specific claim, and genesis means the origin or creation of something. By extension, citogenesis is the creation of text in a reliable source that can be cited to back up a claim.

In the process described here, someone adds an untrue, but plausible-sounding claim to an article in Wikipedia. A writer for some publication sees the information on Wikipedia and adds it to an article, without bothering to check the sources. The strip describes the writer as "rushed", and in this example, the information likely seems of small enough consequence that she may not have considered that someone might have made it up.

Eventually, someone notices the claim in the published source and cites it in the Wikipedia article. The citation now gives the claim credence, as readers don't realize that the official source was based on the Wikipedia article. Thanks to this citation, other reporters, slightly more cautious than the first, consider this bit of information to be reliable and then cite it in articles of their own. Those articles then get cited in Wikipedia, making the claim seem more reliable, encouraging even more reporters (and possibly reporters from more reputable outlets) to believe it and repeat the claim. Eventually, a lengthy list of citations is available, giving an impression of consensus, even though all of it originated with a single article, which was based on an uncited Wikipedia edit.

Four years before, Randall commented on Wikipedia about that process happening to him (on a minor detail), which probably indicates the inception of this comic:

In turn, Randall originated the untrue assertion in this comic that Steven Chu, a physicist, and at the time of the strip the U.S. Secretary of Energy, invented the Scroll lock key, a common button on computer keyboards. Since most people are aware of the scroll lock key but know little about its function or origins, this false information would make for an interesting piece of trivia that would likely spread very quickly.

Following this comic, the actual Scroll Lock and Steven Chu articles were both vandalized by "helpful" editors trying to project Randall's reality on Wikipedia. As of May 2022, the Wikipedia article on Citogenesis redirects

to the "Circular reporting on Wikipedia" section on the article "Circular reporting". The section credits the term "citogenesis" to Randall Munroe, with a citation linking to this comic. To make matters even more surreal, a Wikipedia editor once flagged the link to this xkcd comic as "Dubious - The material near this tag is possibly inaccurate or non-factual."!

We haven't seen a book like the one Randall describes in the title text, but one example of the misuse of Wikipedia by "reliable sources" concerns the former German minister Karl-Theodor zu Guttenberg. His complete name contains fifteen names/words and reads: Karl-Theodor Maria Nikolaus Johann Jacob Philipp Franz Joseph Sylvester Freiherr von und zu Guttenberg. An anonymous user added one more ("Wilhelm") to the German Wikipedia, just the evening before Karl-Theodor zu Guttenberg was presented as the new Federal Minister of Economics and Technology on February 10, 2009. The next day many major German newspapers published this wrong name (translation of bildblog.de).

## #979: Wisdom of the Ancients

*November 18, 2011*

NEVER HAVE I FELT SO  
CLOSE TO ANOTHER SOUL  
AND YET SO HELPLESSLY ALONE  
AS WHEN I GOOGLE AN ERROR  
AND THERE'S ONE RESULT  
A THREAD BY SOMEONE  
WITH THE SAME PROBLEM  
AND NO ANSWER  
LAST POSTED TO IN 2003



All long help threads should have a sticky globally-editable post at the top saying 'DEAR PEOPLE FROM THE FUTURE: Here's what we've figured out so far ...'

## Explanation

This comic refers to a common experience that those trying to solve tech problems have. Typically, people search on Google to try to find solutions to the problem. Sometimes the solution can be found on a software program's website, but the most helpful solutions frequently come from discussions on message boards, particularly for more obscure problems. This is because the odds are rather high that someone else, years ago, had the same problem you're having and resolved it.

However, in this comic, Cueball is unable to find any mention of the problem he's currently facing except for one forum post about it that did not include the problem's solution. This is akin to finding an FAQ with questions but no answers.

The title is a satirical reference to the notion that the "ancients," i.e. from thousands of years ago, possessed knowledge that has been lost to the centuries (such as exactly how Stonehenge was built), and that artifacts from those times do not fully divulge such knowledge. The fact that the "ancient" referred to in the comic is from 2003 (only 8 years before the comic was published) is an exaggeration of the feeling that the forum poster is lost to the sands of time, but in some sense this feeling is nonetheless true, since Cueball is unlikely to be able to contact them.

The title text is a suggestion to forums to be aware of the

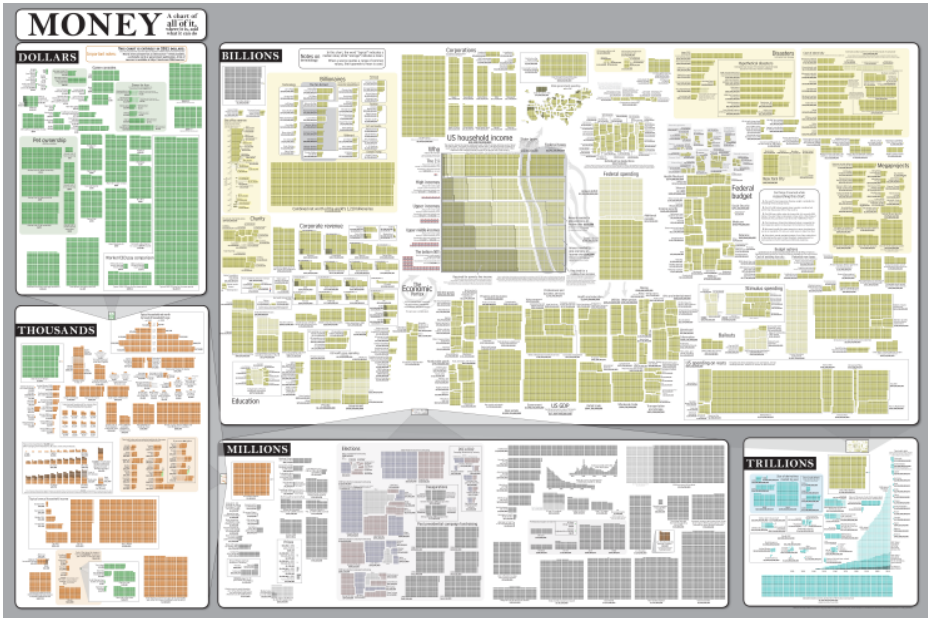
fact that people are likely going to come across such posts in the future and therefore to provide handy summaries of the most helpful conclusions of long threads for them, since combing through several false starts and failed attempts to resolve a problem can be quite tedious. Some forums do indeed follow this practice, pinning the solution or the most helpful approximation to one to the top under the original question.

In 1722: Debugging the title text also mentions googling an error message, explaining what it means if you get zero results. Sort of.



# #980: Money

November 21, 2011



There, I showed you it.

## Explanation

This is a chart comic - a type of comic that Randall does from time to time. He has for instance done maps of the Internet (twice!) and other huge visualizations like this chart Radiation with a similar structure as this chart but with Radiation as the subject. The Radiation chart is most likely the inspiration for this much more comprehensive Money chart.

In this money chart there are five boxes with items on different scales of monetary value denoting prices and values of many things, big and small (with the values contemporary to the comic's release in 2011; most are now more expensive due to inflation). Each scale of dollar increments are different colors. One dollar increments are green - naturally, because American paper money is green. Thousands are orange/red. Millions are gray. Billions are yellow. Trillions are blue. This comic uses the short scale for naming large numbers (so a billion = 1000 millions =  $10^9$  rather than a million millions =  $10^{12}$  as in continental Europe).

Included in one frame is a small man with a red and white striped shirt, blue pants, a cane and a knit cap. He is known as Wally or Waldo (in the US) from the Where's Waldo? books. To not give anything away for those who wish to search for him themselves there will be no spoiler here. But if someone needs a little help... Then by clicking this link you will be directed to the relevant section amongst the five sections where Waldo can be

found. (The link will take you to that section of the full transcript page). If you still cannot find him (or give up in advance) then just search the transcript page for Wally or Waldo. There is a unique header text for this comic.

The title text is a reference to the phrase "Show me the money!" which originates from the film Jerry Maguire.

### **Extra Money pages[edit]**

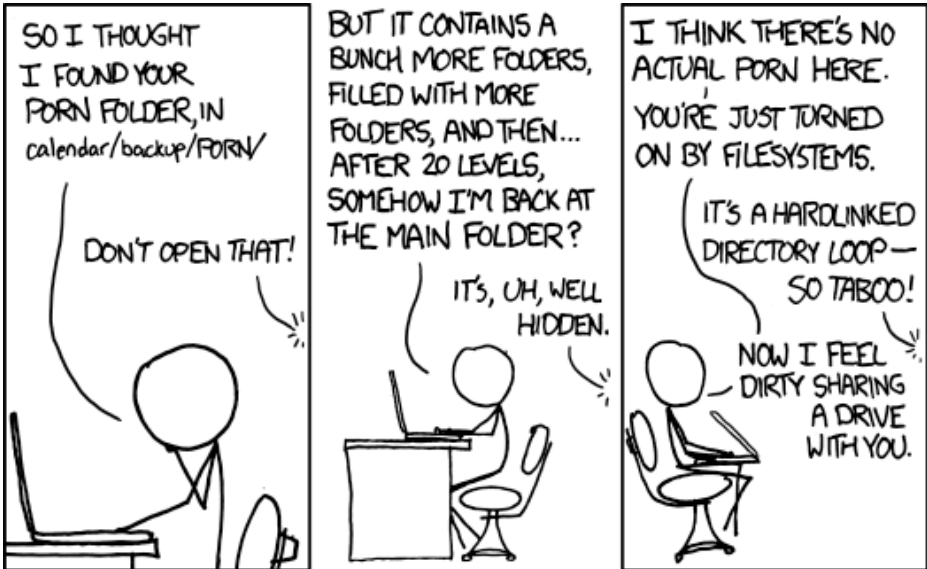
Since this comic is so big and complicated, extra pages have been created to include much more information than is wished for on this main page. These pages are listed here for convenience, but they are also listed in the relevant sections below:

- 980: Money/Transcript - The full transcript of the entire comic can be found here. It is linked from the Transcript section.
- 980: Money/Prices in tables The complete list of every item in the comic.

### **Tables with explanations[edit]**

## #981: Porn Folder

November 23, 2011



Eww, gross, you modified `link()`? How could you enjoy abusing a filesystem like that?

## Explanation

Cueball seems to have found a porn folder. However, it contains a directory loop, set up by a person off-screen. It is possible to actually do this, but it is widely regarded as a very bad idea, as it can break the system in not-so-obvious ways (mostly by causing seemingly-trivial operations to infinite loop). The implication is that the folder does not need to contain pornographic images because the folder is the porn—its violation of the taboo against looping is something the off-screen character finds erotic.

`link()` is the Linux system call to create a hard link. In an unmodified Linux kernel, it will not allow directory hard links for this exact reason; the person who set up the porn folder apparently "forced" Linux to comply, with all of the sexual analogies that suggests.

## #982: Set Theory

November 25, 2011

THE AXIOM OF CHOICE ALLOWS  
YOU TO SELECT ONE ELEMENT  
FROM EACH SET IN A COLLECTION  
AND HAVE IT *EXECUTED* AS  
AN EXAMPLE TO THE OTHERS.



MY MATH TEACHER WAS A BIG  
BELIEVER IN PROOF BY INTIMIDATION.

Proof of Zermelo's well-ordering theorem given the Axiom of Choice: 1: Take  $S$  to be any set. 2: When I reach step three, if  $S$  hasn't managed to find a well-ordering relation for itself, I'll feed it into this wood chipper. 3: Hey, look,  $S$

is well-ordered.

## Explanation

This comic is a pun on the phrase "Proof by Intimidation" which normally is a jocular term used mainly in mathematics. It refers to a style of presenting a purported mathematical proof by giving an argument loaded with jargon and appeals to obscure results, so that the audience is simply obliged to accept it, lest they have to admit to their ignorance and lack of understanding.

However, in this comic, "Proof by Intimidation" is taken to mean that by intimidating the elements within a set, they will conform to the proof (or, as the title text says, they will become "well-ordered"). This is accomplished by believing that the elements can be anthropomorphized such that they feel fear. This interpretation of the term "Proof by Intimidation" bears great resemblance to argument from the stick, which is a fallacious form of reasoning of the form:

1. If not P, I will do you harm.
2. Therefore, P.

This form of fallacy has the distinction, if properly applied, of never being called out as fallacious. Ponytail, however, is threatening the proposition itself, rather than her audience, bringing a level of absurdity to the situation.

The axiom of choice (which has been referenced previously in 804: Pumpkin Carving) says that given any collection of bins, each containing at least one object, it is

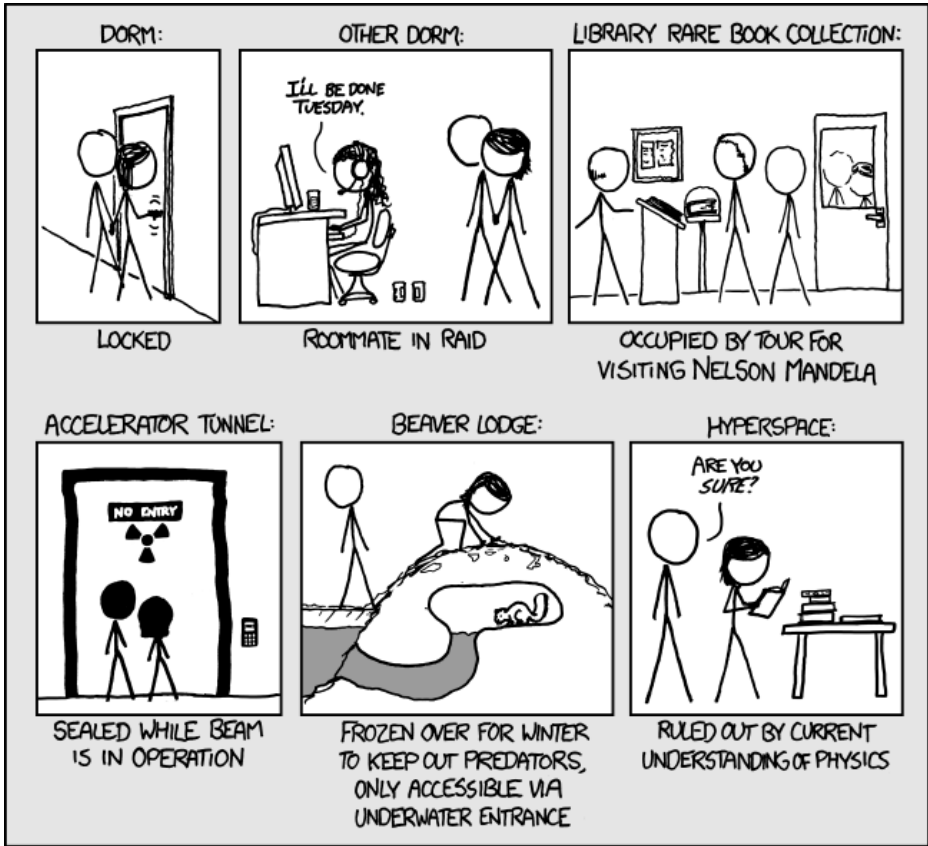


possible to make a selection of exactly one object from each bin. It was later referenced in the title text of 1724: Proofs, another comic about a math class with a similar theme on how teachers teach their student mathematical proofs.

In the title text, the well-ordering theorem states that every set can be well-ordered. A set  $X$  is well-ordered by a strict total order if every non-empty subset of  $X$  has a least element under the ordering. This is also known as Zermelo's theorem and is equivalent to the Axiom of Choice. The woodchipper is a reference to the 1996 film Fargo, where a character uses one to dispose of a body.

## #983: Privacy

November 28, 2011



### COLLEGE LAW #27:

THE AVAILABILITY OF PRIVATE SPACE IS INVERSELY PROPORTIONAL TO THE DESIRABILITY OF THE HOOKUP.

Eventual headline: 'University Researchers Create Life in Lab! Darkness, Faulty Condoms Blamed.'

## Explanation

This comic is about Cueball and Megan attempting to find some privacy to "hook up", which is slang for engaging in sexual activity.

They start at a dormitory, which would offer some privacy. Unfortunately, the door is locked. They go to another dorm, but it is occupied by someone playing a MMORPG who is "in a raid", which means that the gamer is teaming up with others to "raid" something, probably an enemy, and loot their items. This also pokes fun at the fact that some raids may take a very long time to execute, in this case apparently taking on the order of 24 hours. (This comic was published on a Monday morning.)

In the third frame, the two try to go to the library's rare book collection. Such a place would usually be deserted, making it usable for sexual activity. However, it is currently occupied by a visiting Nelson Mandela, who is on a tour of the school.

Moving on to more bizarre places, they next try an accelerator tunnel, another place that would be private. However, the particle accelerator is in use and the door is sealed tight. This would be a normal safety feature to protect researchers (and their genitals) from being exposed to potentially dangerous ionizing radiation from the particle beam.

The couple then try a beaver lodge, which, despite being private, is too tiny to fit in, and the only entrance is underwater. What makes it more difficult to get in is that it is winter, and the ground is presumably frozen solid.

The last place they attempt to go to is hyperspace, science fiction jargon for an 'alternate dimension' that starships supposedly use to travel faster than light. The word is frequently used in the Star Wars movies. However, there is no evidence that anything like hyperspace exists in reality, and in fact current theories of physics do not allow it.

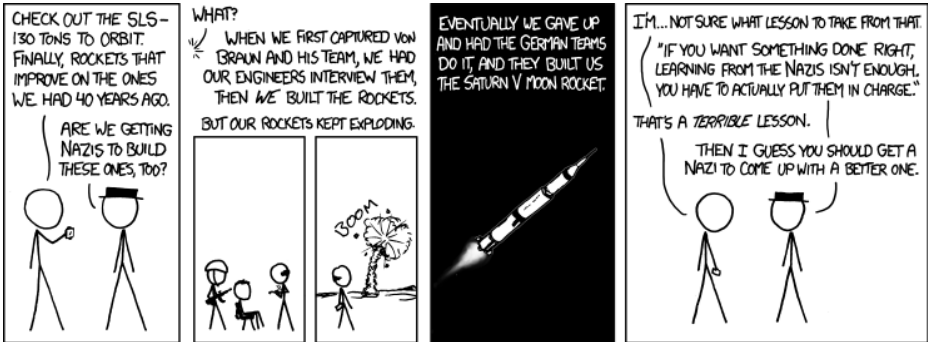
An inverse proportion is a relationship in statistics where one value decreases when the other value in the relationship increases. In this case, the caption posits that the more you want to make love, the less private space there is available to do so.

The title text indicates that the two eventually found privacy for sex in a laboratory, but inadvertently got Megan pregnant. This is a parody of news articles discussing whether scientists can create synthetic life in a lab. This eventual headline appears in a few 1037: Umwelt frames as "Scientists Create Life In Lab", with a similar secondary headline/caption as the punchline.

The comic 658: Orbitals is similar in nature to this comic.

## #984: Space Launch System

November 30, 2011



The SLS head engineer plans to invite Shania Twain to stand under the completed prototype, then tell her, 'I don't expect you to date me just because I'm a rocket scientist, but you've gotta admit--this is pretty fucking impressive.'

## Explanation

SLS, which stands for Space Launch System, is the new launch program being designed by NASA to replace the retired Space Shuttle launch system. In the first frame, Cueball is showing Black Hat something about the SLS, possibly a video on his phone or other portable electronic device.

As usual with his appearances, Black Hat is causing trouble. Specifically he asks if Nazi scientists are going to build NASA's new SLS program. Specifically he mentions the former Nazi party member Wernher von Braun, who was one of the developers of the Saturn V launch vehicle, who came over to America (from Germany) as part of Operation Paperclip and helped develop NASA's space program. The unfortunate reality of Operation Paperclip, and one that Black Hat aims to make people uncomfortable with, is that a significant number of ex-German personnel were Nazi party true-believers, and their defection to America effectively granted them amnesty of any war crimes.

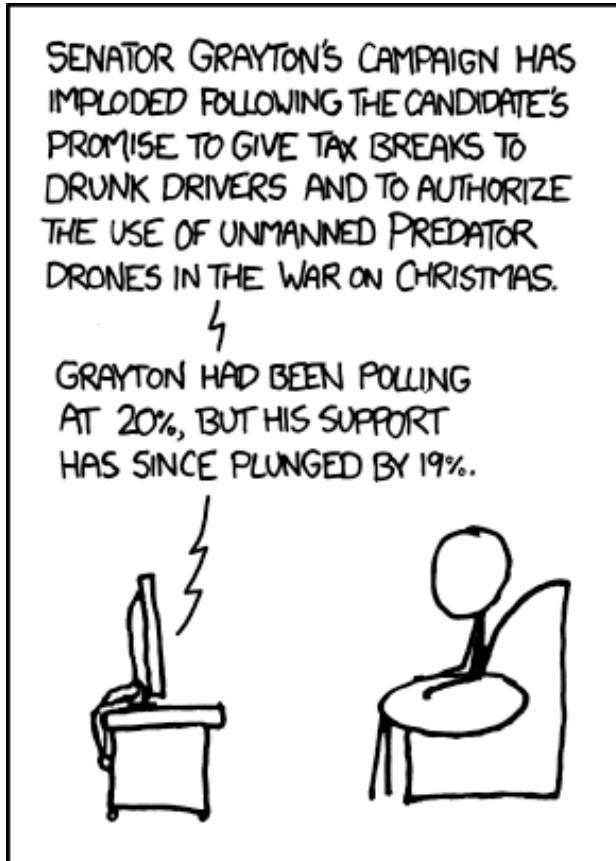
Black Hat extrapolates this sad reality into an obvious troll attempt: that putting actual Nazis in charge will get you results. This assumption is obviously a bridge too far (which is the comic's punchline), but he gets his desired reaction out of Cueball, who is hanging his head (or staring him down- Randall has left no details to distinguish). First he makes it clear that the lesson is that you should put the Nazis in charge (and we saw from

World War Two what that could lead to). Then when Cueball states this is a terrible lesson, Black Hat puts salt in his wound by suggesting that the only way to find a better lesson is to ask a Nazi for a better one - a consistent move if you apply his lesson, but a logic bomb because he suggests to put a Nazi in charge of finding another lesson other than "put a Nazi in charge".

The title text is a reference to Shania Twain's song "That Don't Impress Me Much". Twain's lyrics include the line "Okay, so you're a rocket scientist / That don't impress me much". But, the title text argues that if she stood under the new SLS prototype, she would admit it was in fact, impressive. And it is thus the SLS head engineer (Garry Lyles) plans to invite Shania to do just that. Although he could still understand if she did not wish to date him, he would be surprised if she was still unimpressed.

## #985: Percentage Points

*December 02, 2011*



I HATE THE AMBIGUITY CREATED WHEN PEOPLE DON'T DISTINGUISH BETWEEN PERCENTAGES AND PERCENTAGE POINTS.

Grayton also proposed making college scholarships available exclusively to sexually active teens, amnesty for illegal immigrants who create room for themselves by killing a citizen, and a graduated income tax based on



penis size. He has been endorsed by Tracy Morgan, John Wilkes Booth's ghost, and the Time Cube guy.

## Explanation

Cueball is watching a news story about a (fictional) Senator Grayton and his campaign for the then-upcoming 2012 election. After a series of absurd statements Grayton has lost a substantial number of prospective voters, but the news anchor's failure to specify between percentage and percentage points causes a little ambiguity that gets on Randall's nerves.

Senator Grayton is a fictional character, made up for this comic; which is unusual for xkcd, as it typically uses real-world references (indeed, three real-world names are mentioned in the title text). Given the frankly absurd, and in some cases illegal nature of Grayton's campaign promises, using a fictional character was probably necessary to avoid defaming any real world politicians.

The issues that Grayton supports:

- Tax breaks for drunk drivers: Grayton proposes giving those who have been convicted of a DUI or DWI (i.e. Driving Under the Influence or Driving While Intoxicated) money back on their taxes, when those infractions are typically severely penalized, as drunk driving has resulted in numerous deaths.
- Predator drones and the War on Christmas: The War on Christmas is not a real war; it is simply the perception by some Christians that non-Christians are trying to replace traditional Christmas imagery with more inclusive and generic holiday customs. No

politicians have explicitly announced their support of the "War on Christmas," and the idea that one would not only do so, but would also want to use drones—ostensibly to harm or possibly kill people—in the effort is an absurd exaggeration of a relatively harmless culture war.

The term percentage point is used to overcome an ambiguity when comparing two percentages.

Reduction of a stated number by a percentage

Reduction of a percentage by a percentage

If using the second method of comparing percentages, the approvals rating should be described as having dropped by 19 percentage points. In reality, the distinction between the two methods is often overlooked, leading to confusion.

The caption's issue with "percentage" versus "percentage points" is that if Grayton's 20% approval rating drops by 19%, that means that his support has only dropped 3.8 percentage points since 19% of 20% is only 3.8%. That would mean that even after all his outrageous statements, his support dropped only from 20% to 16.2%. However, if the news reports that his 20% approval rating dropped 19 percentage points, that means his support has dropped to 1%, which appears to be more accurate given Grayton's egregious policy decisions and the description of his campaign as having "imploded."

The punchline to all this is that Randall is more bothered

by the "percent" ambiguity than by Grayton's appalling policy plans.

References in the title text:

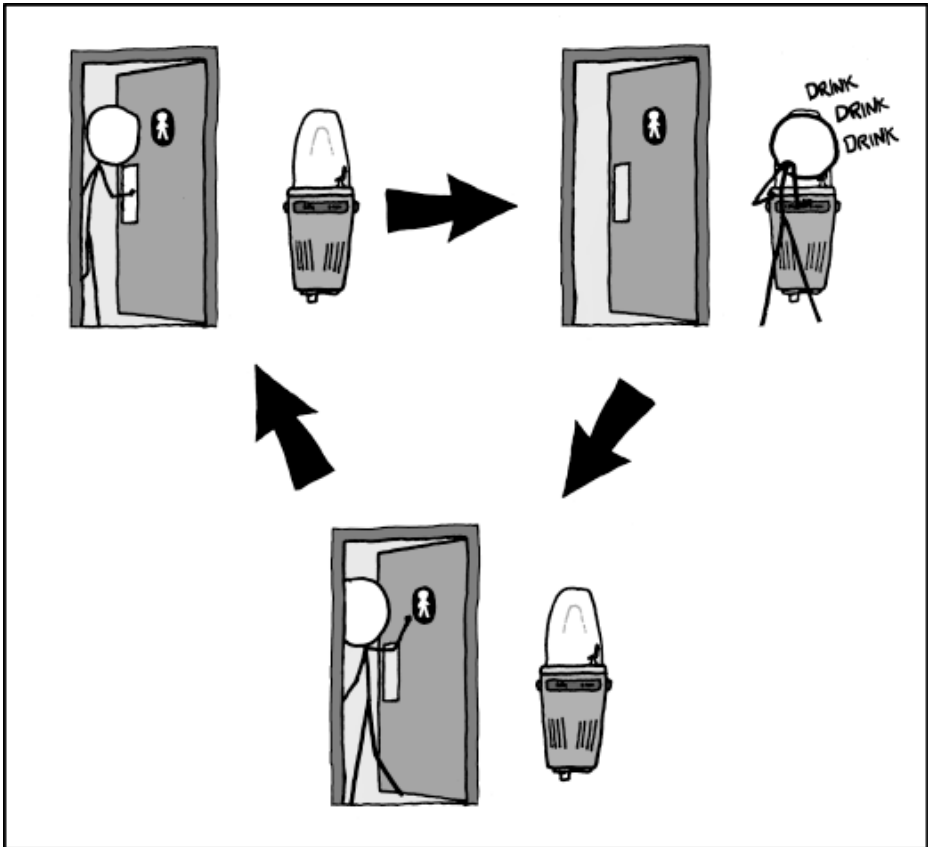
- Tracy Morgan is an actor who plays Tracy Jordan in the TV Show 30 Rock. He has been reprimanded for controversial comments on homosexuals and Sarah Palin (in separate incidents).
- John Wilkes Booth is the person who assassinated Abraham Lincoln. He was a Confederate sympathizer and supported slavery.
- "The Time Cube Guy" would be Otis Eugene "Gene" Ray. To put things very politely (as Mr. Ray was a very angry man with severe schizophrenia), he created a website known as Time Cube where he set out his personal model of reality, which he called Time Cube. He suggested that all of modern physics is wrong, in addition to claiming that religion is evil, specifically Christianity, and that the idea of family is poisoning children. Ray passed away in 2015.
- College scholarships to sexually active teens: Many people think adolescents should not engage in sexual activity, let alone be encouraged to do so by college scholarships. This is the opposite of abstinence programs, which encourage teens not to be sexually active until marriage.
- Illegal immigrants who create room for themselves by killing a citizen: Illegal immigration is a highly controversial topic in the United States. One argument

against illegal immigration is that illegal immigrants are taking jobs away from American citizens. Proponents of immigration assert that this is not the case, since more people in the overall economy creates jobs and brings in more tax revenue. Neither group would be in favor of illegal immigrants murdering citizens even though it would cause no net gain or loss in population.

- Graduated income tax based on penis size: Many people are sensitive about their penis size and would probably consider the measurement of their penises for tax assessment purposes an enormous embarrassment and invasion of privacy. Even the scenario in which those with relatively smaller penises would be levied less tax than those with larger penises would probably not be sufficient for them to accept this policy, and even if they did, those with larger penises would probably consider this policy to be unfair. And the alternative—a scenario in which larger penises pay less taxes—would be both unfair and incredibly demeaning. Additionally, it is also entirely unclear as to how tax laws would apply to anyone without a penis in this scenario.

## #986: Drinking Fountains

December 05, 2011



I AVOID DRINKING FOUNTAINS OUTSIDE BATHROOMS  
BECAUSE I'M AFRAID OF GETTING TRAPPED IN A LOOP.

I've always wondered whether you could drink slowly enough, and eliminate fast enough, that you just sort of peed continuously. But I'm afraid to try because I worry someone might call while I'm doing it and ask what I'm up to, and I won't be able to think of a lie.

## Explanation

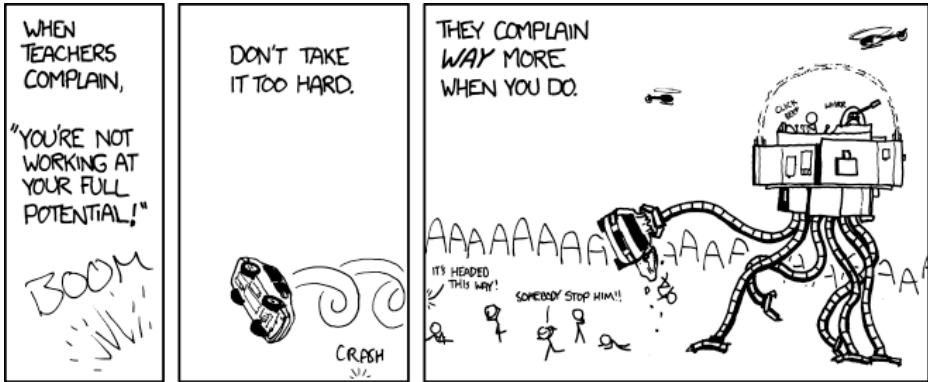
Here, we see Cueball using the restroom; as the title text indicates, he is eliminating the liquid waste from his body, or peeing. Some people feel a brief compulsion to urinate after drinking, even if they don't actually need to. Cueball says that he avoids the use of the drinking fountain right after peeing, because he is apparently one of these people and he is afraid that he will be forced into immediately peeing again. And as in the image above, he would be stuck in a loop.

The title text says Cueball/Randall would be embarrassed in trying to explain his experiment to someone, as an experiment of this nature seems interesting to geeks but gross to non geeks (and to geeks too, if we're being honest)[citation needed], and he wouldn't be able to lie about what he was doing if called by someone.

A thread on yahoo answers with a (purported) Biology major concluded that drinking from a hose and peeing at the same time would not work: the kidneys can only process so much pee at a time, and the majority of it is re-used. But since the experiment doesn't put a lower boundary on the flow that would be regarded as an ongoing pee, this objection is invalid. Constantly sipping and dripping might be possible.

## #987: Potential

December 07, 2011



The bunch of disadvantaged kids I was tutoring became too good at writing, and their essays were forcing me to confront painful existential questions, so I started trying to turn them on to drugs and crime instead.



## Explanation

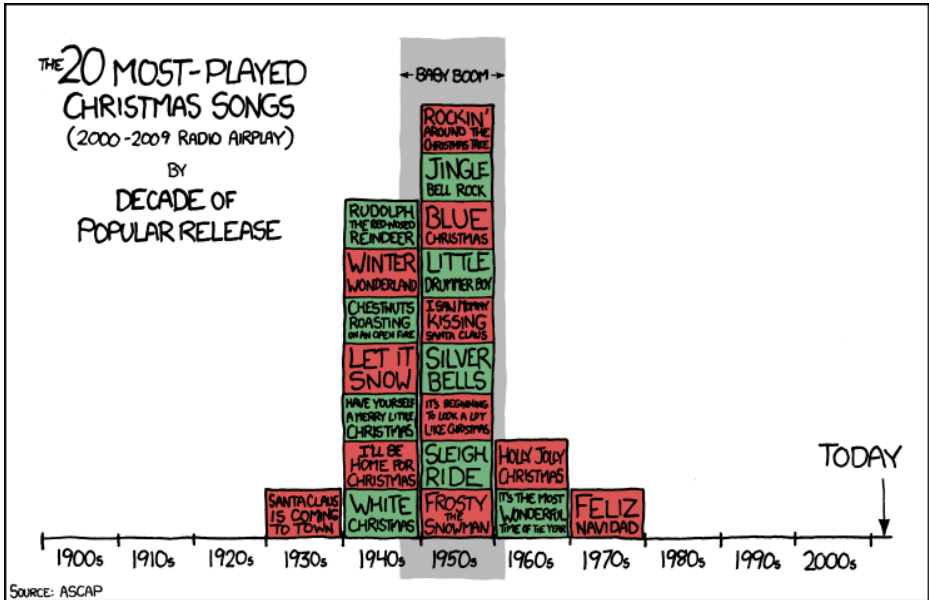
This comic jokes about the common rant by teachers when they are annoyed by lazy or ignorant kids. They commonly say that the kids are not working up to their "full potential" and they need to work harder. The comic comforts the kids who were subject to this — by telling the students if they did reach their full potential, they could, instead of providing better essays and science fair projects, possibly create a monster robot with 6 mechanical legs apparently able to pick up and throw cars, and use machine-guns and force-fields. This is definitely not what they wanted when they said to work to your full potential.[citation needed]

Note that such a huge and complex machine is usually seen in sci-fi books or movies. Generally, it is the main antagonist that creates them.

The title text describes a parallel to the example in the strip, using philosophy rather than engineering. Randall expresses frustration when his teaching gives underprivileged kids the intellectual skills needed to raise existential questions that bug him. His extremely destructive solution is to turn the students onto drugs and crime, where they won't have time or peace of mind to think about philosophy.

## #988: Tradition

December 09, 2011



EVERY YEAR, AMERICAN CULTURE EMBARKS ON A MASSIVE PROJECT TO CAREFULLY RECREATE THE CHRISTMASSES OF BABY BOOMERS' CHILDHOODS.

An 'American tradition' is anything that happened to a baby boomer twice.

## Explanation

This comic uses the source of the American Society of Composers, Authors and Publishers to say that the 20 most played Christmas songs in the US between 2000 and 2009 were all released between the 1930s and 1970s. It conspicuously excludes a number of more modern songs that seem ubiquitous, but this is because those songs do not appear on the ASCAP list.

"Popular release" in this context means release to the general public, not the version of the song which is most popular.

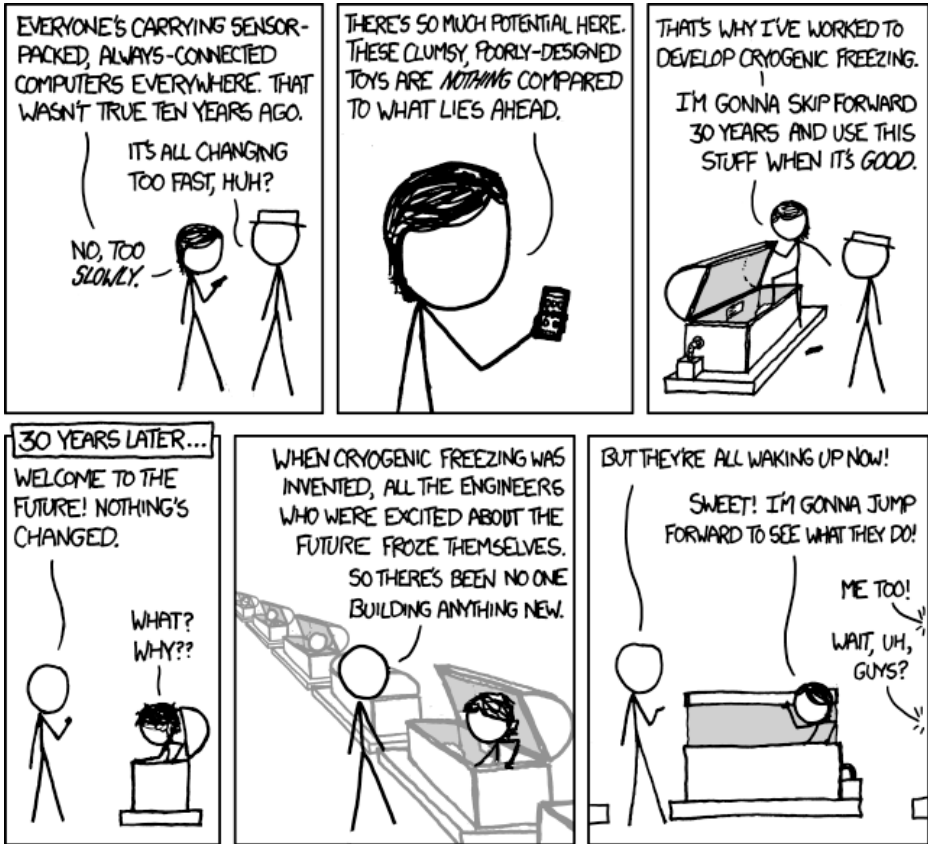
The Baby Boomers were born in a period of time after the second World War when medical advances meant that infant mortality rates were low but common birth control methods were not very effective.

The data appears to come from an ASCAP survey conducted in 2009.

The title text points out that many "traditions" actually have no historical precedent, they're just routines that have been spread by lots of people. The Baby Boomers, since they made up a huge fraction of the US population, were able to accidentally ground many "traditions" that their parents made up in American society just by consensus among themselves.

## #989: Cryogenics

December 12, 2011



'Welcome to the future! Nothing's changed.' was the slogan of my astonishingly short-lived tech startup.

## Explanation

Megan, holding a smartphone, tells White Hat that everyone now carries a computer in their pocket, and refers to how it is always on-line (connected) and is full of sensors (like orientation, vibration and GPS etc.). This is actually amazing and White Hat assumes she is overwhelmed and ask her if the development is changing too fast for her.

But it turns out that Megan is actually disappointed about the pace of technology's improvement, that it goes too slowly. (Who isn't disappointed? From old sci-fi movies' predictions, we should by this point have flying cars and the flying skateboard like in *Back to the Future 2* or a hyper technological future like in *Blade Runner*). She tells White Hat that she has decided to cryogenically freeze herself now that she has developed cryogenics (hence the title) far enough for humans to survive such a deep freeze, and then she climbs into her homemade chamber and plans to skip 30 years ahead in time. (Actually, this should be called "cryonics", preserving humans, not "Cryogenics", which is just science at low temperatures)

Cryonic freezing is the ability to freeze oneself, so that one does not age and doesn't experience the passage of time. It is common in fiction as a useful technology for long space flights or other necessary preservation (like in the book *2001*). Also people who are terminally ill or beyond current technology to save sometimes go

through companies such as the Cryonics Institute in hope that future technology can cure them.

However, to Megan's chagrin, when she wakes up, she is told by Cueball (who is not Terry!) that all the other scientists and engineers that were fascinated about the future had also frozen themselves using her technology, even building their freezing chambers in a line to either side of her chamber, so nothing had been invented while she was frozen.

But as Cueball tells her in the final panel, they are all waking up now, implying that finally something new can be invented! But Megan then immediately decides to freeze herself again to see what happens next, hoping the situation 30 years later will be different. But then the guy in one of the nearby chambers gets the same idea as she did (again). However, if everyone does the same thing again, the situation will repeat itself and nothing will ever change again, as they can continue this process in 30 year steps. (Note that this is not time travel, but still related to this recurring theme in xkcd, and similar methods have been called time travel in xkcd before, like in 630: Time Travel and especially 1617: Time Capsule.)

It seems, however, that the engineer in the nearest chamber, to Megan's right, spots this problem and tries to stop all the other engineers from freezing down again, as he says Wait, guys.

The moral of the comic is:

Don't freeze yourself, engineers and scientists! We need

your help!

The title text refers to tech startups, (and existing tech companies) who often use bold marketing techniques, proclaiming that they are going to "revolutionize" not only a particular product or service, but every facet of a user's life. One of the cliché phrases used in presentations is "Welcome to the future", implying that their product is the only way forwards, and all others are rendered obsolete.

In the title text this cliché is turned on its head, when Randall tells about a very short lived tech startup he tried to get going. The reason for the short life of the company was that it admitted that nothing changed with its slogan: "Welcome to the future! Nothing's changed." This may also be a reference to his beloved TV series, Firefly.

Technology by its nature tends to evolve and improve, and thus a tech company which doesn't change will fall further and further behind their competitors, likely ending up going bust. Which was the case with Randall's (fake) tech startup.

## #990: Plastic Bags

December 14, 2011

FUN FACT:

STORES HAVE A COMPETITION TO SEE  
WHO CAN SPREAD YOUR ITEMS ACROSS  
THE MOST PLASTIC SHOPPING BAGS.



The high I feel when I actually remember to bring my reusable bags to the store--and take them inside rather than leaving them in the parked car--can last for days.



## Explanation

This is another comic with one of Randall's fun facts.

In the United States, at the time this comic was written, most grocery stores used to provide plastic bags free; as well as a "bagger," whose only job is to bag the groceries — although sometimes this function is performed by the cashier. An exception to this rule might be "extreme discount" stores, such as Aldi. Customers are rarely, if ever, expected to bag their own groceries, even if they bring a reusable bag. It follows that sometimes a bagger might become a bit overzealous and use too many bags for too few products. This comic is mocking this tendency to go overboard, which is incredibly wasteful. The last frame takes this practice to its absurd and frustrating end, showing a reusable bag that has been double bagged with plastic bags. Exactly why bags are provided is probably a topic best left to academic discussion, but suffice to say that it is the state of the industry in the U.S. Perhaps grocery chains are concerned that if they did not provide free plastic bags, customers would defect, instead, to a competitor. Most shoppers view plastic bags and bagging by the store as givens.

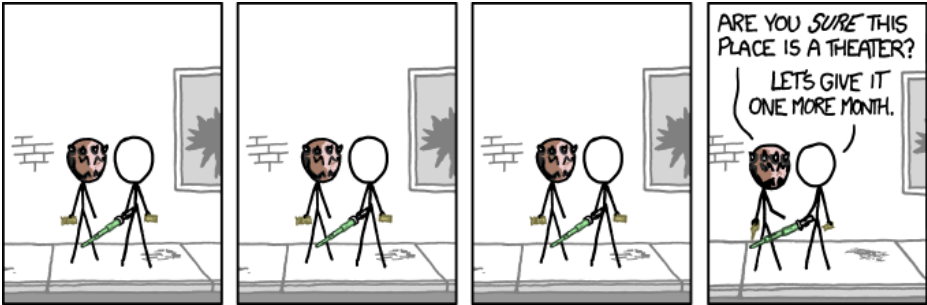
Relatively recently, some U.S. jurisdictions have begun to join more and more governments world-wide to either ban plastic bags, charge customers for them, or generate taxes on each sold bag. Using Washington, DC (Randall's home turf) example, as of 2010 customers are

charged a \$0.05 tax (again, by the local government and NOT by the grocery store) for each plastic bag, and receive an equivalent rebate for each reusable bag. While today it is accepted as a fact of life, the tax angered many at its adoption, even spurring some to claim that they would do their shopping in the next state over (in this case, Virginia), driving 5 or 10 miles to save 5 or 10 cents (this would address the theme of wasting money to save a trivial amount, addressed by Randall in 951: Working). The tax has since become accepted as a fact of life, and has been quite successful at its initial goal of reducing the amount of bags discarded in area rivers and streams.

The title text refers to the idea that while many attempt to make the environmentally-conscious decision to bag their groceries with reusable bags, thereby keeping plastic bags out of landfills, sometimes they forget to bring their bags with them from the car, or even leave the bags at home altogether. Randall is commenting on the sense of euphoria he derives from a relatively simple task: remembering to bring the reusable bags to the grocery store and taking them into the store, rather than the good feeling from helping clean up the environment.

## #991: Phantom Menace

*December 16, 2011*



We could go to the theater across town and see if it's opened **THERE** yet, but we don't want to lose our place in line.

## Explanation

Cueball is waiting outside a building with an unidentified character, who is dressed as Darth Maul, a character from *Star Wars: The Phantom Menace*. Before its release in May 1999, *The Phantom Menace* was one of the most anticipated movies of all time, with fans camped in lines outside of movie theaters as much as a full month in advance of ticket sales. In this comic, Cueball and his friend are apparently still waiting to see the movie, not having realized that they are waiting outside of a building that is not a movie theater. More importantly, they have been waiting for twelve years, which should be long enough to realize their error.

Darth Maul, the source of Cueball's friend's costume, is a Sith apprentice in the film. The Sith are the group of characters in the *Star Wars* universe who embrace the dark side of the Force and are the enemies throughout the series. Cueball is holding a cheap replica of a lightsaber, which is the weapon used by the Jedi and the Sith.

This comic seems to be poking fun at those people who are willing to wait long in advance for the release of some product or the first theatrical release of a movie. The title text expands upon this when one of the characters states that going to a theater across town may be better, but he is worried about taking the chance due to the possibility of losing their place in this line, a misplaced sense of priorities if the line goes nowhere, and they are presently

the only two in it.

## #992: Mnemonics

December 19, 2011

XKCD PRESENTS:  
SOME NEW

### SCIENCE MNEMONICS



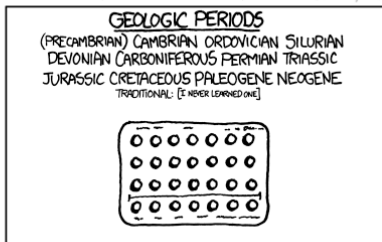
PLEASE EMAIL MY DAD A SHARK  
OR PEOPLE EXPECT MORE DRUGS AND SEX



BIG: KARL MARX GAVE THE PROLETARIAT ELEVEN ZEPPELINS, YO.  
SMALL: MICROSOFT MADE NO PROFIT FROM ANYONE'S ZUNES, YO.



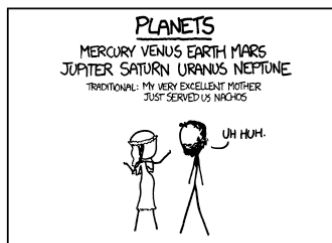
KATY PERRY CLAIMS ORGASMS  
FEEL GOOD SOMETIMES  
OR: KERNEL PANICS CRASH OUR FAMILY GAME SYSTEM.



POLYCYSTIC OVARIAN SYNDROME DOES CAUSE PROBLEMS  
THAT JUDICIOUS CONTRACEPTIVES PARTIALLY NEGATE.



"BIG BROTHER REPTILIAN OVERLORDS," YELLED  
GLENN, "BRAINWASHING VIA GROUND WATER!!"  
OR: BE BOLD, RESPECT OTHERS; YOU'LL GRACIOUSLY  
BECOME VERSATILE, GREAT WINKPEDIA!



MARY'S 'VIRGIN' EXPLANATION MADE  
JOSEPH SUSPECT UPSTAIRS NEIGHBOR

'Sailor Moon's head exploded once' and 'Some men have explosive orgasms' both work for the Great Lakes from west to east (Paddle-to-the-Sea order).

## Explanation

A mnemonic is a trick that makes memorization easier. To memorize a sequence of names, a common type of mnemonic uses the beginning letters of the names in the sequence and invents another phrase using different words that start with the same letters. For example, the order of operations goes Parentheses, Exponentiation, Multiplication and Division, Addition and Subtraction, and the traditional mnemonic goes Please Excuse My Dear Aunt Sally, or in Britain: Brackets, Indices, Multiplication, Division, Addition and Subtraction: there is no mnemonic, just the word "BIMDAS" to remember. To make them more memorable, mnemonics are usually quite silly and often vulgar. In this comic, Randall invents various scientific mnemonics, some of them as suggested replacements for traditional ones.

The category is listed at the top of the box, the members are listed below that. Then there is the traditional mnemonic that children are usually taught in school to help them remember. Below the comic is one or two options for new mnemonics suggested by Randall. The top one is illustrated in the frame.

- SI Prefixes are the prefixes for the systems of units to indicate the orders of magnitude for the given value, and since there is one prefix set for large numbers (increasing multipliers), and another one for the small ones (similarly progressive fractions), the mnemonic needs two lines.

Karl Marx, as visible in the comic, was a German philosopher and economist who, among other things, popularized the ideas of socialism and communism. Central to his ideas was the dictatorship of the proletariat, or the working class achieved by an uprising of the lower class, which taken literally could be done using zeppelins.

Microsoft's Zune was a failed mp3 player that Microsoft brought to market. It never caught on.

- Taxonomy is the science of identifying and naming species. Katy Perry, portrayed in the panel, is an American pop music singer, whose popular songs are ones like "Firework" or "I Kissed A Girl".
- In the geologic periods frame, the illustration is of a month's worth of "the pill", a common contraceptive. The affliction Polycystic Ovarian Syndrome, causes women to have an irregular menstrual period. This can be treated with a low powered version of the contraceptive pill. Here, Randall has misspelt the word "contraceptive".
- Resistor Color Codes represent the values 0 through 9 and are used to indicate the resistance value of discrete cylindrical resistors, with 2 or 3 color bands around the resistor body for the significant digits of the value and another color band for a power of ten multiplier. A resistor with Yellow-Violet-Red bands would be  $47 \times 10^2$  or 4700 ohms. Glenn Beck is shown in this panel, a far-right conservative commentator in the US who used to have a show on the Fox News Network. His



yelling about "Big Brother reptilian overlords" is a reference to his real-life promotion of conspiracy theories. Resistor color codes were previously mentioned in 227: Color Codes.

The prevailing mnemonic for resistor color codes is rather vulgar (and memorable), hence Randall's comment "none I care for". It involved Bad Boys (or sometimes Black Boys, helping to distinguish black from brown) and Young Girls, as well as a specific girl named Violet. However, there are many other mnemonics, to the point that Wikipedia has a whole page dedicated to them.

Be Bold is a Wikipedia credo. Respect Others may be a reference to Assume Good Faith, another Wikipedia philosophy.

- In the Planets frame, the illustration is of Mary and Joseph, who in the story of the Birth of Jesus in the Bible, were mother and father to Jesus. However, Mary's conception of Jesus was from God and Mary was still considered a virgin. This mnemonic shows Joseph not really believing that story. Ironically the upstairs neighbour could have multiple meanings as you can't get more upstairs than heaven and thus God. Given the snarky tone of most xkcd comics take, it is likely a corporeal neighbor that is being suspected, but it is curious that a neighbor of the upstairs variety is specifically referenced especially given the lack of urban density in the time of Christ.

Earlier traditional Planets mnemonics included Pluto,

which was "officially" considered a planet before 2006. The traditional mnemonic at that time was My Very Excellent Mother Just Served Us Nine Pizzas, instead of just nachos.

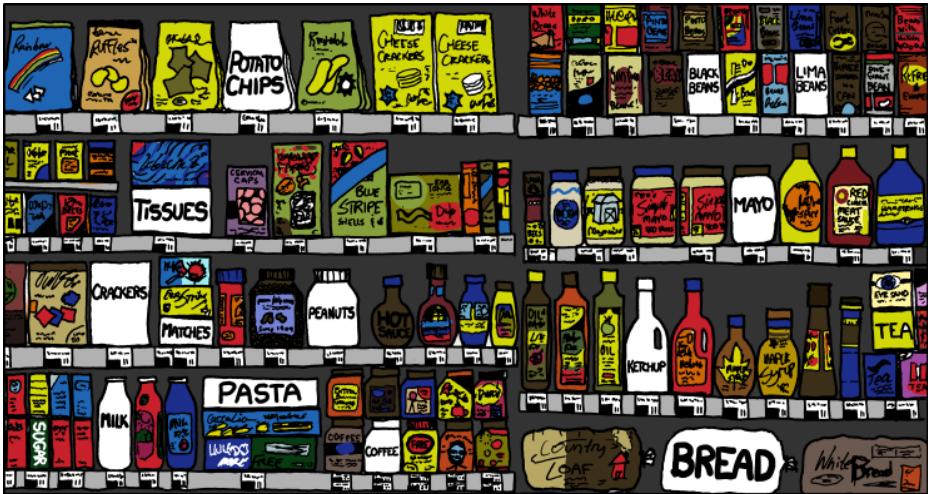
- The Great Lakes mentioned by the title text are Superior, Michigan, Huron, Erie, and Ontario

Sailor Moon is an anime and manga series. The eponymous Sailor Moon (Usagi Tsukino), has never had her head exploded, however.

Paddle-to-the-Sea is an illustrated children's book by Holling C. Holling about a toy boat's journey through the Great Lakes.

## #993: Brand Identity

December 21, 2011



IF I EVER SOLD A LINE OF SUPERMARKET GOODS,  
THIS IS HOW I'D BUILD A BRAND IDENTITY OVERNIGHT.

Legally-mandated information would be printed on the back or discreetly along the bottom. In small letters under the nutrition information it would say 'Like our products? Visit our website!' There would be no URL.

## Explanation

This comic presents Randall's idea for a line of food products all with clear black font on a white background. The products with black block lettering and white background stand out from the other items in this comic. The irony is that even though the branding isn't terribly creative, the lack of complexity is what causes the products to stand out. These product packaging styles resemble no-frills products and generic brands. For example, in Canada, the "No Name" generic brand of low-cost products sold by Loblaw's features a plain yellow label with the description of the product in bold black text, and occasionally an image of the product (for people who can't read). The brand name is minimalized, as are other legally-required elements (e.g., the weight of the product). Another of Loblaw's generic brands, President's Choice (PC), currently has a plain white background with black bold text for the labels on most of its products (usually with an image of the product as well as the brand name), although more recently, text in accent colors has been introduced.

The style of packaging might be a reference to *The Prisoner* TV series from the '60s, a dystopia set in a village ("the Village") locked out from the outside world. The shops there sell only "Village food", as seen in this example.

In the title text, the lack of a listed URL relates to the lack of branding on the package. It is possible that by

omitting the URL, the consumer's curiosity will be aroused and they'll search the internet for the actual site.

### **List of all products in the shelves[edit]**

- Rainbow
- Ruffles
- [unreadable]
- Potato Chips [new brand]
- [unreadable]
- cheese crackers [Flavor 1]
- cheese crackers [Flavor 2]
- - [unreadable]
- [?] Beets
- - [unreadable]
- Tissues [new brand]
- cervical caps [what product is this? see comments]
- [unreadable]
- blue stripe shells
- ear tonic
- - [unreadable]
- - [unreadable]
- Crackers [new brand]
- - [unreadable]
- Matches [new brand]
- - [unreadable]

- Peanuts [new brand]
- hot sauce [probably not the new brand, see comments]
- - [unreadable]
- sugar [probably not the new brand, see comments]
- - [unreadable]
- Milk [new brand]
- - [unreadable]
- Pasta [new brand]
- caccalione [there is no pasta named like this says the List of pasta]
- free
- [unreadable]
- coffee
- [unreadable]
- Coffee [new brand]
- - [unreadable]
- white beans
- - [unreadable]
- sanfra beans [there are no beans named like this says the Bean#Types]
- pinto beans
- bean
- pinto beans
- Black beans [new brand]

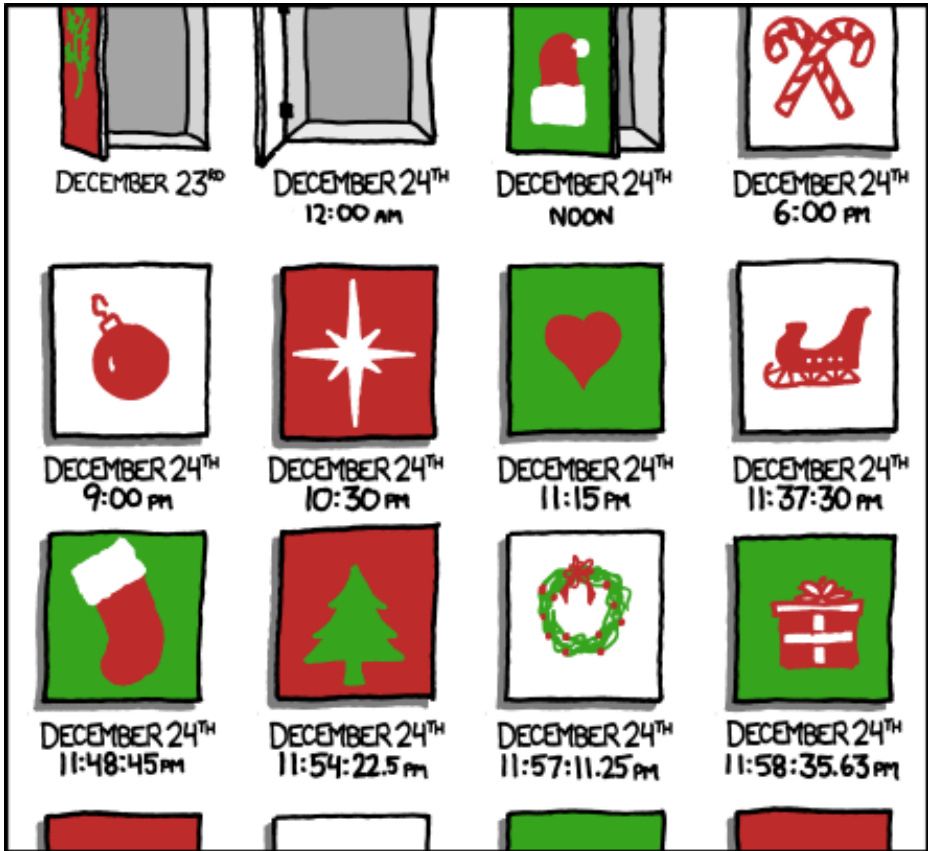
- [unreadable]
- do beans [there are no beans named like this says the Bean#Types]
- black beans
- [unreadable]
- lima beans
- Lima beans [new brand]
- fart cutters
- three [unreadable] can
- [unreadable]
- pine + giant bean
- beans with [unreadable]
- refrie[d beans; unfinished due to bowing of can]
- [84 top] [unreadable]
- [84 middle] [unlabeled]
- [84 bottom] Bees
- [unreadable]
- mayonnaise
- roo's simple mayo
- simp[le] mayo [unfinished word due to bowing of can]
- Mayo [new brand]
- [unreadable]
- red meat sauce
- [unreadable]

- oil
- [unreadable]
- oil
- Ketchup [new brand]
- - [unreadable]
- maple syrup
- - [unreadable]
- eye sand
- tea [yellow package with clear black font]
- tea
- - [unreadable]
- tea
- country loaf
- Bread [new brand]
- white bread



## #994: Advent Calendar

*December 23, 2011*



### ZENO'S ADVENT CALENDAR

I think you could get up to about 11:59:57 before you'd have trouble swallowing the chocolates fast enough. At that point, you'd need some kind of a liquify-and-chug apparatus to get up over the 11:59:59 barrier. Anyway, Merry Christmas!

## Explanation

An Advent calendar is a special calendar used to count or celebrate the days in anticipation of Christmas. They come in a multitude of forms, from a simple paper calendar with flaps covering each of the days, to fabric pockets on a background scene, to painted wooden boxes with cubby holes for small items. Advent calendars typically take the form of a large rectangular card with "windows", of which there are usually 24: one for each day of December leading up to and including Christmas Eve (December 24). Consecutive doors are opened every day leading up to Christmas, beginning on December 1. The calendar windows open to reveal an image, a poem, a portion of a story (such as the story of the Nativity of Jesus), or a small gift, such as a toy or a chocolate item.

This comic, however, depicts an Advent calendar which has a chocolate every time they get halfway to Christmas. This is a joke because of Zeno's paradox, which said "Before a moving object can travel a certain distance, it must travel half that distance. Before it can travel half the distance it must travel  $1/4$  the distance, etc. This sequence goes on forever. Therefore, it seems that the original distance cannot be travelled, and motion is impossible." This means that eating chocolates at diminishing intervals will make it so Christmas never happens.

The title text says that when you get close to midnight, it gets physically impossible to eat the chocolates fast

enough to keep up, but you could get to the one-second-away mark with a chocolate liquefier and feeder tube.

Going from the second to the last of the visible time stamps it goes like this: At 11:57:11.25 PM there is still remaining 00:02:48.75 (2 minutes 48 seconds and 75 hundredth of a second.) Half of this time period will then progress before the next windows time stamp, that is 00:01:24.375 (1 minute and 24.375 s). This will then give the next time stamp by adding to the previous and we get: 11:58:35.625 PM. This has been rounded to 35.63 s in the comic. Similarly the time stamp for the next four windows, whose top are visible below, can be calculated starting from the fact that there is now only 00:01:24.375 left of the day.

- 13: 42.1875 s left, so the time stamp is: 11:59:17.8125
- 14: 21.09375 s left, so the time stamp is: 11:59:39.90625
- 15: 10.546875 s left, so the time stamp is: 11:59:49.453125
- 16: 5.2734375 s left, so the time stamp is: 11:59:54.7265625

It would take three more windows before crossing the 11:59:59 line with less than one second to go. At the 19th window there would only be 0.6591796875 seconds left of the day for a time-stamp of 11:59:59.3408203125. So that would be a window another line further down, even below the green window

(no. 15) that is just visible at the button of the panel. And you would have to eat four chocolates in less than five seconds from window no. 16 to fulfill Randall's prediction.

When reaching the 24th window there would be 0.0206 s left, so that is 6 chocolates in 0.638 s. That may be a good place to stop, but of course you could continue at least until reaching the Planck time of  $5.39 \times 10^{-44}$  s. That limit will not be reached before window 162, so there are still 138 chocolates left for those last two hundredths of a second.

1153: Proof is also about Zeno, and 1577: Advent is a very different longer running Advent calendar (but with only a finite number of windows).[citation needed]

## #995: Coinstar

December 26, 2011



HOLIDAY TIP: COINSTAR DOES NOT HANDLE CHOCOLATE COINS WELL.

Plus they take like 9%.

## Explanation

This is another one of Randall's Tips, this time a Holiday Tip.

Chocolate coins are a popular holiday candy, and thus this is another Christmas comic. These candies are usually plain chocolate formed in the shape of coins and covered in metallic foil wrappers.

Coinstar machines accept all your loose coins, sort them, count them, and then give you the same amount of money in paper currency, around 9% less as it says in the title text. You may find similar machines in grocery stores and shopping malls around the US and Canada.

These machines work by vibrating a box with a series of slots along one side, which each corresponding to the sizes of standard accepted coins. The vibrations move the coins along the different slots. If they pass through the slots the coins are then fed into a mechanism with a counterweight that's balanced to test the weight to ensure that it has captured the appropriate coin. Coins of the right size but wrong weight (such as similarly sized coins of different currencies) are dropped back out into a reject chute to be retrieved by the customer. Coins that do not fit the standard sizes also get rejected in the same way. There are also various anti-theft mechanisms that prevent coins from being counted and then retrieved. Coins that meet the programmed criteria are funneled into internal repositories and are counted towards the

total.

The chocolate coins in the comic appear to have damaged the machine. As the only property that the candies share with actual currency may be its appearance the machine would not be designed to handle the softer material causing the machine to malfunction and create the unusual noises presented. The chocolate may have fouled the initial vibrating tabulator; it may be that the coins are getting caught in the reject chute or are fouling the scales. In any case, an alarm has sounded, likely triggered by an electronic circuit going "pop". The alarm could also be the anti-theft system being triggered, thus causing the machine to shut down and preventing false totals from registering.

The title text suggests that the machine would take its customary 9% from the total of the chocolate coins which is ironic since the reader knows that their candy has insignificant monetary value.

Here is a list of all of the sounds with explanations for each:

- Whirrrrrrr - The sound of the machine's internal mechanisms moving, possibly when coins are being sorted or processed.
- Bzzt - A short, electronic sound that could indicate an error or a notification, like a coin being rejected.
- Kachunk - The sound of coins being dropped into a collection bin or the sound of the machine accepting a

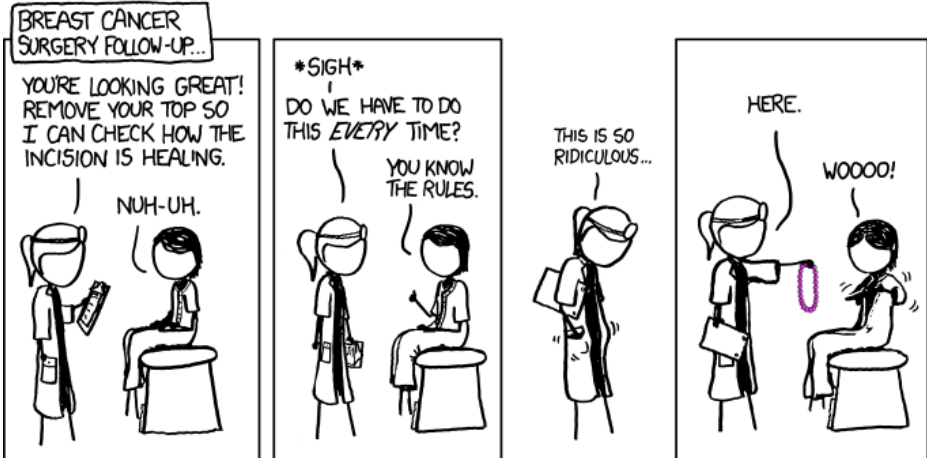
coin.

- Tshhhhhhhhhh - This could represent the sound of air being released or a similar mechanical action, perhaps related to the sorting process.
- Clickclickclickclick - The sound of gears or levers moving, possibly as the machine sorts or counts the coins.
- GRIND - A more intense sound that might indicate the machine is processing a large number of coins or dealing with a jam.
- Pop - The sound of a coin being released or a compartment opening, perhaps when the transaction is complete.
- beeeeeeeeeeeep! - This is possibly an error tone alerting a mechanical fault caused by the chocolate coin.



## #996: Making Things Difficult

December 28, 2011



Favorite mastectomy breast prosthesis idea: a fake boob containing a spare rechargeable battery, accessed via a nipple USB port. Complete with a ring of LED charge indicators in the areola!

## Explanation

This comic is a reference to the breast cancer surgery that Randall's fiancée/wife underwent, and is one of many comics about cancer he made because of this. This comic is the follow up appointment after the surgery. When doctor Ponytail asks Megan to take her shirt off, she refuses until Ponytail gives her a necklace of purple beads. Younger and more boorish Mardi Gras tourists sometimes offer necklaces like this in exchange for the exposure of a person's breasts.

Megan's line "You know the rules" implies that Megan has stipulated that every time she takes off her shirt for the doctor, a necklace of beads must be exchanged. In the official transcript the doctor is described as an Oncologist, a doctor who works with cancer patients, and Megan/Randall's wife is described as a Delightfully Awesome Person. It is also stated that the oncologist fake-annoyedly searches for something in pockets and that it is a Mardi Gras bead necklace she takes out.

Below the xkcd logo, in the header at the top of the comic page there is the following text: "Some context for the cancer comics:" and below that a link to a Blag post regarding family-illness that talked about the real world events leading up to this comic. This is one of the few comics where a character wears regular clothes, but doctor Ponytail has been seen before in 883: Pain Rating and later in 1713: 50 ccs. Megan is in both, and Cueball also in the latter.

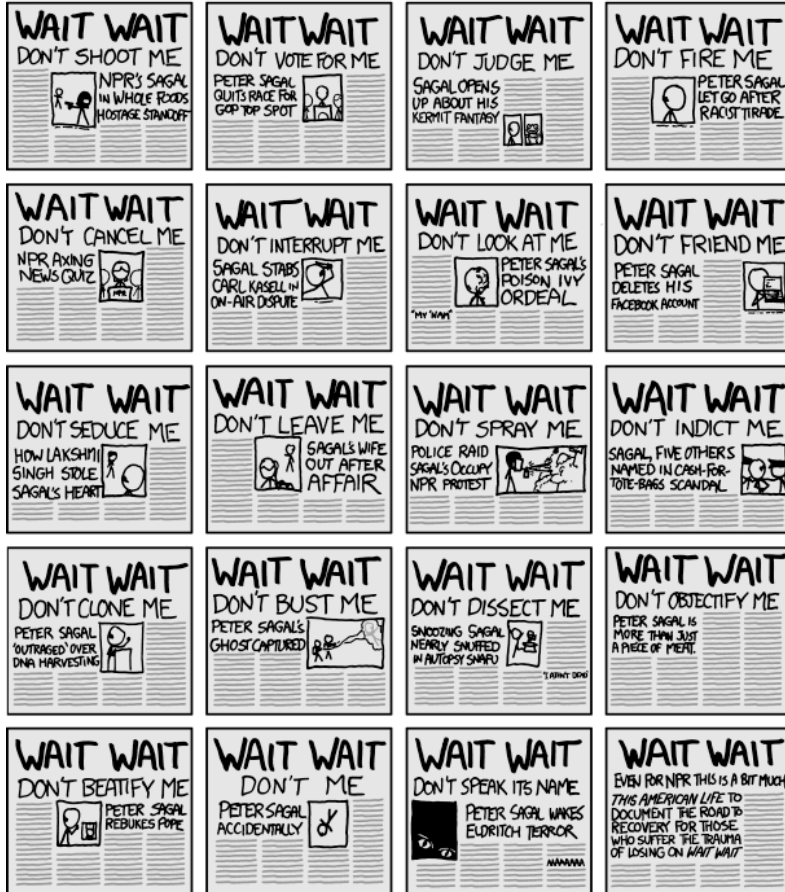
The title text refers to a mastectomy, the surgical removal of one or both breasts. One possible treatment for breast cancer is to surgically remove the breast. After this procedure a false or prosthetic breast is often added to retain the prior physical appearance. The title text suggests this prosthesis could serve as a charging station by including the following features: a spare battery inside the prosthesis, a USB port where the nipple would normally be, and a ring of lights showing the charge level of the battery arranged around the areola (the darker circle of skin around the nipple).

## #997: Wait Wait

December 30, 2011

# HEADLINES

STOCKPILED IN CASE PETER SAGAL, HOST OF NPR'S  
WAIT WAIT DON'T TELL ME, DOES SOMETHING NEWSWORTHY IN 2012



You can't stab Carl Kasell. He sounds all slow and stentorian, but he moves like a snake.

## Explanation

Wait Wait... Don't Tell Me is an hour-long weekly radio news panel game show produced by Chicago Public Radio and National Public Radio. The show is hosted by playwright and actor Peter Sagal. Each episode ends with the panelists making up a potential future news story, usually with implausible "facts". This comic is making puns on the title of the show based on what Peter Sagal might have done that was newsworthy.

Carl Kasell, who also served as the news anchor on Morning Edition, was the show's official judge and scorekeeper until May 2014 (after this comic was published), when he retired and was replaced by Bill Kurtis.

The 1st row, 4th paper may refer to the Laugh Factory Incident of 2006.

In the 3rd row, first paper, Lakshmi Singh is NPR's national midday newscaster. This paper leads to the second paper on the third row, in which Sagal's wife divorces him over his affair with Singh.

In the 3rd row, 3rd paper is a reference to a protest at UC Davis (on the campus of University of California, Davis) protests in early 2012 in which sitting, peaceful protesters were calmly pepper-sprayed in their faces by a police officer. That spawned an internet meme of epic proportions.

In the 4th row, 2nd paper is a reference to the movie, Ghostbusters.

In the 4th row, 3rd paper is a reference to Granny Weatherwax of Terry Pratchett's Discworld novels; Granny Weatherwax is a witch who carries a sign saying "I ATEN'T DED"(sic) when having out-of-body experiences.

In the 5th row, 2nd paper is a reference to another internet meme in where someone leaves out the verb in the sentence. The implication is that the verb is something bad, but which bad thing is left as an exercise to stew in the reader's mind. See the I Accidentally \_\_\_\_ meme for more information.

In the 5th row, 3rd paper is a reference to stories and myths in which an entity can be summoned, awoken, or alerted to someone's presence when its name is spoken. A well-known example of this is the entity Cthulhu in the Lovecraft mythos.

Two years later another New Years comic, 1311: 2014, took a similar look at what could happen in 2014, just as this does for 2012. Interesting enough the title of that comic (just the year it was looking at) is more related to the title of the next comic after this one, which is also a New Year comic, and the title is also just the number of the year: 998: 2012.

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